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Upon the opening of any new oil field, it seems desirable that a geologic and economic study be made of the area—such as means will allow—in order to be of benefit both from an educational point of view to the commonwealth and as a source of some help to the oil trade. The primary object of this brief report is to show the stratigraphic relations of the field; preserve in printed form the number of records available from the Oakland City oil field, and to present the economic features peculiar to this territory. The saving of records is especially important in view of the fact that much future work with oil areas will be based upon stratigraphic and structural studies of them. It so often occurs in successful oil fields that, once the producing sand is located, wells are put down with such rapidity that records are carelessly kept and are practically lost for future use. We wish to urge that all records be kept, as well as conditions will allow, and be sent to the Survey.

No attempt has been made in this report to show the local structural features of the sand in this field, because the Indiana Survey has not the means or time at present to run levels to all the wells, making therefrom a structural diagram indicating the presence and possible extension of anticlines, terraces and domes, suggestive of the accumulation of oil and gas. Water conditions of the oil horizon generally accompany a structural report and greatly assist in the study. It is unfortunate that such could not be made at this time. Some structural conditions are pointed out later, but they were taken from the Ditney Folio of the U. S. Geological Survey.

The method of study involved in this report, aside from the field work of gathering records and data for the accompanying map, was to take representative records of the Oakland City field and make a stratigraphic study of them in comparison with records of the Illinois fields. It was essential to do this, inasmuch as the several oil areas lay within the so-called Eastern Interior Coal Basin, and the formation from all areas were comparable. The

depths to the various horizons were variable, but they were due to the position of the wells upon the flanks of the basin.

*Acknowledgments.* In the preparation of this report the writer had the valuable assistance of Raymond S. Blatchley, in charge of the oil studies of the Illinois State Geological Survey, for the geological interpretations and the stratigraphic comparisons. The remainder of the report would not have been possible except for the aid of the various operators in the field, who furnished well records and other information. To Messrs. W. H. Heydrick of Princeton; Frank Woodard and W. W. Fleming of the Ohio Oil Company; H. W. Vedder, G. H. Shoup, Walter Cox, W. E. Hancock, B. C. Chappel, V. S. Welch and the Murphy Oil Co., of Oakland City; John Miller of Vincennes, W. J. Rodgers of Evansville, and others, the writer expresses his appreciation and thanks.

*Location of the Field.* What is known to oil men as the Oakland City Oil Field is located about three and a half miles east of Oakland City, in the civil townships Monroe and Patoka of Pike County. Although the field is in Pike County and Oakland City is in Gibson County, the field is known as the "Oakland City Field" because all the oil men make their headquarters in that city, and all of the supply houses are there located.

The whole producing field is located in congressional township 2 S., Range 8 W. No production has been found outside of the district thus defined. Drilling has been done to the south, northwest and north of this territory, but with no production. Within the above mentioned area there had been drilled, up to December 1, 1910, 201 producing wells, 18 gas wells and 32 dry holes. On the above date there were 13 drilling wells within these limits. The pool as it now stands is approximately four miles long and two miles wide in its widest place.

*Drainage and Elevations.* The drainage of the field finds its way to the Patoka River, which flows in a westerly direction a mile to to the north of the field. The streams through the territory (Township 2 S., Range 8 W.) are the South Fork or the South Patoka, Barren Creek and Hat Creek. The first of these, a fair sized stream, is sluggish, and in rainy seasons overflows and covers its broad bottoms.

The topography of most of the area is very rolling, consisting of rugged uplands with the broad bottoms along the South Fork. The only permanent Government bench-mark in the field is at the center of section 26, Monroe Township, and shows an elevation of 458 feet above sea level. The Ditney Folio of the U. S. Geological

Survey gives a range of surface contour levels of 400 to 500 feet for the area.

Chas. W. Shannon, in the 1909 report of this Department, says of the soils and crops of this area: "Corn grows fairly well but gives a low yield. Small fields of wheat are grown in the upper parts. Hay makes a rank growth, but is sometimes rather coarse. The soils along the entire (Patoka) system have been largely leached of their natural plant foods, and such cultivation as will restore organic matter to the soil will be of benefit."

*Transportation.* The only railroad crossing the field is the Southern or L. E. & St. L. Railway. However, the Evansville and Indianapolis Railway runs through Oakland City, and the field is therefore easy of access from all directions.

The roads in this section are almost all unimproved, road material being scarce. They are, for the most part, dirt roads, and during wet weather become very badly cut up by the extensive hauling to and from the field. However, there are several very good rock roads kept up by the county.

*Early History of the Field.* The history of the Oakland City field dates back probably ten years, when a company of Oakland City business men looking for gas put down a bore north of Oakland City in Gibson County, on what was then the Alcorn farm, now owned by Mr. Chas. Feltner of Oakland City. This bore was drilled to a depth of from 1,050 to 1,100 feet. It is said that the same salt sands and limestone formations were passed through as are found in the present field.

The next operations in this territory were those of Messrs. Lobby and Davis of Winslow. Their first attempt to get oil was on the F. F. Wood farm in the northwest quarter of the northwest quarter of section 18 (2 S., 7 W.), Patoka Township. Here a good showing of oil was found, but the depth at which it was located is not known. Farmers are said to have baled out the oil and hauled it off in barrels. The well was never pumped. Later this well was drilled deeper with the hopes of getting enough production to warrant pumping. It was, however, drilled into salt water and abandoned. The above mentioned parties then moved to their second location on the E. Freshour farm, southeast quarter of the southwest quarter of section 7, near the town of Arthur. This test was never drilled deep enough to get results, owing to legal difficulties, and the bore was abandoned. These wells are known as the Pioneer wells, and had a great bearing on the location of the Oakland City pool.

Another unsuccessful attempt was made to get oil about two miles north of Winslow, which resulted in a dry hole at from 1,200 to 1,300 feet.

In 1907 Mr. W. H. Heydrick of the Michael Murphy Oil Company came to Oakland City and looked over the territory. After having studied the Robinson field, he had the theory that, as this field had reached its southern limits and the anticline had run out, the oil of the Illinois basin had drifted farther east for its level. He therefore set about to choose a place to wildcat. Being influenced by the Pioneer well, and believing that coal outcroppings denote more or less the presence of an anticline, he chose the location of the Oakland City pool. He then set about leasing an extensive territory.

On July 26, 1907, the Michael Murphy Co. began operations on the C. D. Houchens farm, in the southwest quarter of the northwest quarter of section 15, Patoka Township. A few days later the Southern Oil Company started a well near the Arthur wells, on the T. W. Wood farm, northwest quarter of the northwest quarter of section 18, Patoka Township. This was drilled into the sand before the Murphy well. The producing sand was reached at 1,165 feet, and a fair showing of oil was obtained. This well was shot and for a short time pumped 15 barrels per day. Later it was shut down because the amount of oil produced had dwindled until there was not enough to warrant tank building. Recently, however, the well has been cleaned out and put to pumping.

The Murphy bore, on the C. D. Houchens farm, turned out a dry hole with a very small showing of oil at 1,162 feet, the drill going to 1,444 feet. A careful record of the strata passed through was kept, and can be found under the heading Section 15, Patoka Township.

Benedum and Trees, operators, then drilled a dry hole on the George Skinner farm, southwest quarter of the northwest quarter of Section 18, Patoka Township. This location was just south across the line from the Southern Oil Company's well on the T. H. Wood farm.

Early in 1908 the Michael Murphy Company started operations on the M. Burnett lease, southwest quarter of the northeast quarter of Section 26, Monroe Township, and on April 28, 1908, they drilled in the first gas well in the Oakland City field. A fairly complete record was kept of this well and will be found under Section 26 in the Detailed Study of Logs.

In August, 1908, Murphy & Company moved to the J. Yager farm, northeast quarter of the southwest quarter of Section 26, Monroe Township, and a quarter of a mile south and a little west of the Burnett well, drilling in the first producing well in the field. This well flowed natural, i. e., without being shot, 30 barrels a day for a considerable time. The usual excitement following a strike in a new territory ensued. Leases were taken in all directions, large bonuses being paid for those in the immediate vicinity. The excitement became greater when W. J. Rodgers & Co. drilled in the second producing well in the field on the M. Skinner lease, southwest quarter of the northwest quarter of Section 24, Monroe Township (2 S., 8 W.), about one and one-half miles northeast of the Yager well. This well started with 30 barrels daily production.

Promiscuous wildcatting started in all directions, resulting for the most part in dry holes. Gibson & Cox started a wildcat on the Joel Skinner farm, northeast quarter of the northeast quarter of Section 3, Monroe Township (3 S., 8 W.), and about a mile and a quarter south and a half mile west of the Yager No. 1 well. This was the farthest south attempt and resulted in a dry hole. Several other dry holes were drilled, and then Gibson & Cox drilled in the third producing well on the Amelia Skinner lease. Drilling then centered around these three producers and gradually the operators felt their way till they have reached all but the northern limits of the pool. In a general way the field may be said to have begun in the southern end and gradually moved north.

## GENERAL GEOLOGY OF THE AREA RELATING TO OCCURRENCE OF OIL AND GAS.

All oil men who are in close touch with field operations are familiar with the various formations, such as sandstone, shale, limestone, coal and red rock, comprising combinations of rocks that underlie most of Illinois, the western portion of Indiana and a small part of western Kentucky, or what is known as the "Eastern Interior Coal Basin." The rocks are all sedimentary and are, for the most part, of considerable regularity in distribution or areal extent and sequence. The study of these relations is known as stratigraphy. By means of graphic comparisons, the formations in one locality can be correlated with those of another, and thus the operator is enabled to know approximately the geological horizons in which he is working. All the oil areas of Illinois, and of

Princeton and Oakland City, Indiana, lie within this Eastern Interior Coal Basin. The general formations of each field are comparable throughout the basin and vary only in position, depending on whether the field lies along the flanks or in the central part of the basin. The stratigraphic column is much longer, of course, in the central portions of the basin than it is toward its outer edges, as in the Lawrence and Martin County fields of Illinois when compared to the Sparta and Bond County fields of Illinois and the Princeton and Oakland City fields of Indiana.

### THE EASTERN INTERIOR COAL BASIN.

The Eastern Interior Coal Basin is estimated by Ashley* to have an area of 35,000 square miles in Illinois, 6,500 square miles in Indiana and 4,500 square miles in Kentucky, making a total for the entire field of 46,000 square miles. The basin dips very evenly to the center from its western, northern and eastern sides, and very rapidly from its southern rim, the deepest part of the basin lying in the vicinity of Wayne, Hamilton, Edwards and White counties of Illinois.

The only notable structure interrupting the gentle trend of the sides of the basin is the LaSalle anticline, running from the vicinity east of LaSalle, Illinois, in a southeastwardly direction to Sadorus, in Champaign County, Illinois. From thence it passes near Tuscola and enters the main oil fields of Clarke, Crawford and Lawrence counties. From the latter county it continues in a direct line past St. Francisville, Illinois, under the Wabash, and on into Indiana. The Princeton oil area seemingly lies along the anticline. The remaining oil areas of Illinois and Indiana, such as Sparta, Greenville, Sandoval and Centralia of Illinois, and Oakland City of Indiana, lie along terraces or slight folds on the flanks of the basin, not far from its edges. These are thought to be more or less regular deformations in their extensive trend, but perhaps somewhat locally broken or irregular.

*Local Structure.* The only attempt in this report to show the structural relations of the field is made by use of contours on the No. V coal in the accompanying field map. These were taken from the Ditney Folio of the U. S. Geological Survey. They show the position of the coal above sea level in 400 and 450-foot contour lines. Where the lines assume a dash appearance, the coal has disappeared by erosion and its position has been determined by out-

*Ashley, Geo. H., The Eastern Interior Coal Field, Twenty-second Ann. Rep. U. S. Geol. Surv., pt. 3, 1900-1901, pp. 265-305.

cropping. The irregularity of the contours and the distance separating them indicate the approximate structure. The area in the northern loop of the 400-foot contour represents a high place in the coal and a corresponding one in the lower formations. This includes sections 9 and 10 of T. 2 S., R. 8 W. A further study of the coal outcrops on the Ditney Folio shows a low spot on the west side of the second loop of the 400-foot contour. This includes sections 16 and a part of 15 of T. 2 S., R. 8 W., and should be avoided in prospecting. The area north of the town of Arthur, Section 13, T. 2 S., R. 8 W., indicates a broad, flat place in the coal, showing only a mild rise. The structure seems to be a terrace, and would naturally serve as a collecting ground for oil and gas. The salt water has probably found its way by gravitation into the western slope of the basin and, through the relative gravities of water, oil and gas, crowded the latter two into the terrace, where they were trapped and held captive by pressure. The salt water to the east of the field has, perhaps, repeated the action in another terrace farther up the sides of the basin. Therefore, judging from the present development, the area toward Ayrshire seems suggestive of oil and gas accumulation.

The prominent feature of the contouring is the knob-like figure described by the 450-foot contour, including portions of sections 23, 26, 25 and 35 of T. 2 S., R. 8 W. This is a notable example of the use of structural diagrams in locating oil and gas areas. The area within the "knob" is a high place in the formations and would indicate a gas accumulation in the oil and gas bearing horizons. This is proven to be a correct assumption by the presence of good gas wells in or close to the indicated deformation. The areas to either side of the neck of the "knob" are low places in the structure and hence are not favorable to accumulation.

*Prospective Areas.* The areas appearing to be favorable to the accumulation of oil and gas upon the accompanying map lie in a northwest extension of the northern end of the present field, reaching into the loop of the 400-foot contour; a northeastward trend of the same pool toward Ayrshire, and a more thorough investigation of the so-called "knob" in sections 23, 26 and 35 of Monroe Township might develop some paying wells.

Several suggestive areas, indicated by contouring on the Ditney Folio, are as follows: (1) In and about the town of Winslow and slightly to the northwest of it, comprising sections 31 and 32 of T. 1 S., R. 7 W., and sections 25 and 36 of T. 1 S., R. 8 W.

(2) Sections 16, 17, 18, 19, 20, 21 and 22 of T. 1 S., R. 8 W.,

two or three miles northwest, north and northeast of the town of Glezen.

(3) The area, two miles in extent, southwest of Littles, seems to show considerable irregularity in structure. Sections 27, 33 and 34 of T. 1 S., R. 8 W.

(4) The area in sections 16, 17, 20, 21, 22, 27, 28, 29 and 33 of T. 3 S., R. 7 W.

(5) The area east and southeast of Boonville, in sections 5, 6 and 7 of T. 6 S., R. 7 W.; sections 20, 19, 30, 29 and 31 of T. 5 S., R. 7 W.; sections 25 and 36 of T. 5 S., R. 8 W., and sections 1, 2 and 12 of T. 6 S., R. 8 W.

*Stratigraphy.* The stratigraphic comparisons of the Oakland City oil logs with those of other localities in the Eastern Interior Coal Basin are shown in Plate I. The illustration was made from the following detailed logs:

No. 1.* *Old Sparta Gas Well, No. 2, near Sparta, Randolph County, Illinois. Location: N. E. quarter S. E. quarter, Section 2, T. 5 S., R. 6 W.*

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Drift | 57 | 57 |
| Limestone | 4 | 61 |
| Coal (No. 7?) | 3 | 64 |
| Shale | 25 | 89 |
| Limestone | 12 | 101 |
| Coal (No. 6) | 6 | 107 |
| Fire clay | 2 | 109 |
| Clay shale | 20 | 129 |
| Limestone | 12 | 141 |
| Shale | 8 | 149 |
| Coal (No. 3?) | 4 | 153 |
| Clay shale | 15 | 168 |
| Sandstone | 200 | 368 |
| Clay shale | 20 | 388 |
| Limestone | 40 | 428 |
| Shale | 20 | 448 |
| Sandstone | 25 | 473 |
| Caving soapstone | 15 | 488 |
| Limestone | 64 | 552 |
| Shale | 22 | 574 |
| Sandstone | 10 | 584 |
| Shale | 20 | 604 |
| Limestone | 10 | 614 |
| Conglomerate | 16 | 630 |
| Caving red rock | 15 | 645 |

*Nickles, J. M., Rept. Ill. Board Worlds Fair Commissioners. 1893, p. 191.

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Shale | 10 | 655 |
| Limestone | 20 | 675 |
| Sandstone | 38 | 713 |
| Clay shale | 67 | 780 |
| Limestone | 20 | 800 |
| Clay shale | 22 | 822 |
| Sandstone | 5 | 827 |
| Dark gray stone | 6 | 833 |
| Shale | 21 | 854 |
| Limestone | 14 | 868 |
| Shale | 48 | 916 |
| Limestone | 4 | 920 |
| Red shale | 40 | 960 |
| White sandstone | 18 | 978 |
| Red shale | 16 | 994 |
| Limestone | 5 | 999 |
| Red sandstone | 11 | 1,010 |
| Red shale | 2 | 1,012 |
| Salt water sandstone | 13 | 1,025 |

No. 2. *Greenville Gas Area. S. T. Henry, well No. 1, drilled by the Summerfield Gas Co. Authority, F. T. Rowland. Location: N. W. quarter, S. E. quarter, S. E. quarter, Section 15, T. 5 N., R. 3 W., near Greenville, Bond County, Illinois.*

| | | |
|---|---|---|
| Clay | 30 | 30 |
| Sandy shale | 80 | 110 |
| Loose sand (water) | 15 | 125 |
| Shale | 15 | 140 |
| Sand | 3 | 143 |
| Shale | 10 | 153 |
| Sandy shale (water) | 10 | 163 |
| Shale | 8 | 171 |
| Loose sand (water) | 9 | 180 |
| Hard sand | 6 | 186 |
| Shale (water) | 20 | 206 |
| Shale | 30 | 236 |
| Shale | 80 | 316 |
| Sand | 49 | 365 |
| Shale | 10 | 375 |
| Sand (water) | 13 | 388 |
| Shale | 15 | 403 |
| Hard sand | 5 | 408 |
| Soft shale | 5 | 413 |
| Lime (water) | 5 | 418 |
| Muck | 5 | 423 |
| Shale, black | 7 | 430 |
| Shale, white | 5 | 435 |
| Lime | 6 | 441 |

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Shale, black | 8 | 449 |
| Shale, white | 5 | 454 |
| Shale, black | 5 | 459 |
| Coal | 2 | 461 |
| Shale | 5 | 466 |
| Sand | 5 | 471 |
| Shale | 14 | 485 |
| Shale | 3 | 488 |
| Shale | 5 | 493 |
| Sand (water) | 42 | 535 |
| Shale (black) | 5 | 540 |
| Shale (white) | 43 | 583 |
| Coal | 4 | 587 |
| Shale (white) | 40 | 627 |
| Shell | 3 | 630 |
| Shale (black) | 10 | 640 |
| Shale (white) | 20 | 660 |
| Shale (dark) | 10 | 670 |
| Coal | 5 | 675 |
| Shale | 45 | 720 |
| Sand (water) | 45 | 765 |
| Shale | 5 | 770 |
| Sand | 10 | 780 |
| Shale | 24 | 804 |
| Lime | 8 | 812 |
| Shale | 8 | 820 |
| Limestone | 12 | 832 |
| Shale | 5 | 837 |
| Red rock | 15 | 852 |
| Shale | 28 | 880 |
| Lime shell | 4 | 884 |
| Shale | 5 | 889 |
| Lime | 16 | 905 |
| Shale | 12 | 917 |
| Shale | 12 | 929 |
| Lime | 15 | 944 |
| Shale | 16 | 960 |
| Red rock | 12 | 972 |
| Shale | 10 | 982 |
| Red rock | 8 | 990 |
| Sand | 35 | 1,025 |
| Shale | 6 | 1,031 |
| Sand (no water) | 8 | 1,039 |
| Lime | 6 | 1,045 |
| Lime and sand shells | 17 | 1,062 |
| Lime shell | 2 | 1,064 |
| Sand | 3 | 1,067 |
| Sand (water) | .. | 1,079 |

**Dry well**

No. 3. *Sandoval Oil Area. R. Benoist, No. 1, drilled by Treat and Crawford. Authority, A. M. O'Donnel. Location: N. E. quarter of N. W. quarter, Section 8, T. 2 N., R. 1 E., near Sandoval, Marion County, Illinois.*

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Soil | .. | 153 |
| Shale | 39 | 192 |
| Lime (water) | 12 | 204 |
| Shale | 341 | 545 |
| Lime | 25 | 570 |
| Coal | 6 | 576 |
| Shale and shells | 54 | 630 |
| Sand | 10 | 640 |
| Shale | 30 | 670 |
| Sand | 45 | 715 |
| Shale and shells | 105 | 820 |
| Sand | 10 | 830 |
| Shale | 10 | 840 |
| Lime | 5 | 845 |
| Slate | 35 | 880 |
| Sand (water) | 17 | 897 |
| Shale | 20 | 917 |
| Sand | 43 | 960 |
| Shale | 25 | 985 |
| Lime | 15 | 1,000 |
| Shale | 33 | 1,033 |
| Lime | 12 | 1,045 |
| Shale | 45 | 1,090 |
| Sand | 10 | 1,100 |
| Slate (cave) | 25 | 1,125 |
| Sand (water) | 42 | 1,167 |
| Shale | 28 | 1,195 |
| Lime | 20 | 1,215 |
| Shale | 25 | 1,240 |
| Sand (water) | 15 | 1,255 |
| Lime | 15 | 1,270 |
| Shale | 5 | 1,275 |
| Lime | 15 | 1,290 |
| Shale | 20 | 1,310 |
| Lime | 5 | 1,315 |
| Shale | 5 | 1,320 |
| Lime | 30 | 1,350 |
| Sand | 15 | 1,365 |
| Shale | 5 | 1,370 |
| Red rock | 5 | 1,375 |
| Shale | 15 | 1,390 |
| Red rock | 11 | 1,401 |
| "Stein" sand (oil 1,401 to 1,408) | 37 | 1,438 |
| Shale | 27 | 1,465 |

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Lime | 5 | 1,470 |
| Shale | 20 | 1,490 |
| Red rock | 5 | 1,495 |
| Lime | 13 | 1,508 |
| Gas sand | 15 | 1,523 |
| Lime | 6 | 1,529 |
| Gas sand | 9 | 1,538 |
| Oil sand | 28 | 1,566 |

No. 4. *Centralia Oil Area. F. Koester No. 1, drilled by the Ohio Oil Co. Authority, W. W. McDonald. Location: N. W. quarter, S. W. quarter Section 3, T. 1 N., R. 1 E., near Centralia, Marion County, Illinois.*

| | | |
|---|---|---|
| Soil and clay | 40 | 40 |
| Lime | 8 | 48 |
| Shale | 77 | 125 |
| Lime | 7 | 132 |
| Shale | 68 | 200 |
| Shale | 390 | 590 |
| Lime | 8 | 598 |
| Shale | 2 | 600 |
| Lime | 10 | 610 |
| Coal | 6 | 616 |
| Shale | 4 | 620 |
| Lime | 5 | 625 |
| Sand | 15 | 640 |
| Lime | 5 | 645 |
| Shale | 10 | 655 |
| White shale | 175 | 830 |
| Shale and lime | 5 | 835 |
| Coal | 10 | 845 |
| Broken sand | 16 | 861 |
| Shale | 54 | 915 |
| Salt sand | 15 | 930 |
| Shale | 20 | 950 |
| Sand. | 10 | 960 |
| Shale | 25 | 985 |
| Salt sand | 100 | 1,085 |
| Shale | 65 | 1,150 |
| Salt sand | 2 | 1,152 |
| Shale | 18 | 1,170 |
| Sand | 50 | 1,220 |
| Lime | 30 | 1,250 |
| Shale and lime | 50 | 1,300 |
| Shale | 40 | 1,340 |
| Sand | 85 | 1,425 |
| Shale | 15 | 1,440 |
| Lime | 10 | 1,450 |

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| White shale | 20 | 1,470 |
| Water sand | 15 | 1,485 |
| Red rock | 15 | 1,500 |
| Lime | 20 | 1,520 |
| Shale and lime | 40 | 1,560 |
| Shale | 30 | 1,590 |
| Sand | 4 | 1,594 |
| Shale | 11 | 1,605 |
| Oil sand | 20 | 1,625 |

No. 5. *Lawrence County, Illinois, Oil Field.* Drilled by The Everson Oil Co. Location: N. E. quarter of the N. E. quarter, Section 36, Christy township, Lawrence County, T. 4 N., R. 13 W., near Bridgeport, Illinois.*

| | | |
|---|---|---|
| Conductor | 12 | 12 |
| Lime and sand | 24 | 36 |
| Slate | 61 | 97 |
| Slate and lime | 43 | 140 |
| Slate | 90 | 230 |
| Sand | 16 | 245 |
| Slate | 15 | 260 |
| Sand. | 54 | 314 |
| Slate | 131 | 445 |
| Lime | 10 | 455 |
| Slate | 200 | 655 |
| Lime | 5 | 660 |
| Slate and shell | 110 | 770 |
| Sand and water | 35 | 805 |
| Slate | 95 | 900 |
| Upper Bridgeport sand | 25 | 925 |
| Slate and shell | 150 | 1,075 |
| Sand | 10 | 1,085 |
| Slate | 25 | 1,120 |
| Sand and water | 25 | 1,145 |
| Slate | 85 | 1,235 |
| Slate and sand showing of oil and gas Buchanan sand | 105 | 1,340 |
| Sand | 70 | 1,410 |
| Sand | 60 | 1,470 |
| Lime | 20 | 1,490 |
| Slate | 10 | 1,500 |
| Blue and black slate | 25 | 1,525 |
| Blue and black sand | 10 | 1,535 |
| Red rock | 8 | 1,543 |
| Very hard lime | 12 | 1,555 |
| Slate break | 5 | 1,560 |
| Very hard lime | 20 | 1,580 |
| Slate | 40 | 1,620 |

* Published on page 296 of Bull. 8, Ill. State Geol. Surv.

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Lime | 20 | 1,640 |
| Black slate | 40 | 1,680 |
| Top of oil sand | .. | 1,680 |
| Bottom of oil sand | 50 | 1,730 |

No. 6. *Lawrence County, Illinois Oil Field. E. Fyffe No. 7 well, drilled by the Snowdon Bros. Oil Co. Location: N. E. quarter of the N. E. quarter, Section 1, Bridgeport township, Lawrence Co., Illinois, T. 3 N., R. 13 W.*

| | | |
|---|---|---|
| Sand (water) | 90 | 200– 290 |
| Sand (water) | 80 | 310– 390 |
| Lime shell | 8 | 402– 410 |
| Red rock | 5 | 412– 417 |
| Sand | 25 | 450– 575 |
| Coal | 3 | 578 |
| Sand | 30 | 790– 820 |
| Sand (water) | 20 | 900– 920 |
| Hard shell | 3 | 930– 933 |
| Limestone | 30 | 970–1,000 |
| Sand (water at 1,145) | 130 | 1,110–1,240 |
| Sand | 25 | 1,275–1,300 |
| Limestone | 35 | 1,305–1,340 |
| Sand | 25 | 1,345–1,370 |
| Sand (water) | 23 | 1,440–1,463 |
| Red rock | 8 | 1,499–1,507 |
| Limestone | 20 | 1,529–1,549 |
| Sand (water) | 12 | 1,567–1,579 |
| Limestone | 22 | 1,601 |
| Sand | 32 | 1,633–1,665 |
| First oil from | .. | 1,641–1,665 |

No. 7. *Princeton, Indiana, Oil Area. Chas. Brownlee farm, drilled by the Interstate Oil and Gas Company. Location: South half S. W. quarter, Section 6, T. 2 S., R. 11 W., near Princeton, Gibson County.*

| | | |
|---|---|---|
| Drift | 40 | ... |
| Soapstone | 75 | 115 |
| Coal | 3 | 118 |
| Fire-clay | 4 | 122 |
| Limestone | 10 | 132 |
| Soapstone | 148 | 280 |
| Limestone | 35 | 315 |
| Shale and mud | 35 | 350 |
| Slate | 20 | 370 |
| Limestone shale | 1 | 371 |
| Slate | 14 | 385 |

*Blatchley, Raymond S., The Princeton Petroleum Fields of Indiana, Thirty-first Ann. Rep. Dept. Geol. and Nat. Reso. of Ind., 1906, pp. 559–593.

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Coal | 7 | 392 |
| Blue mud | 43 | 435 |
| Slate | 15 | 450 |
| Asphalt (?) | 6 | 456 |
| Limestone | 30 | 486 |
| White sand | 6 | 492 |
| Limestone | 35 | 527 |
| Shale | 45 | 572 |
| Slate | 15 | 587 |
| Coal | 5 | 592 |
| Fire-clay | 5 | 597 |
| Sand | 15 | 612 |
| Slate | 6 | 618 |
| Shale | 5 | 623 |
| Gray sand | 20 | 643 |
| Shale | 36 | 679 |
| Limestone | 13 | 692 |
| Coal | 7 | 699 |
| Shale | 40 | 739 |
| Gas sand | 12 | 751 |
| Shale | 18 | 769 |
| Sandstone | 100† | 869 |
| Shale | 25 | 894 |
| Sandstone | 100 | 994 |
| Shale | 5 | 999 |
| Gray sand | 30† | 1,029 |
| Asphalt base (?) | 25 | 1,054 |
| Shale | 125 | 1,179 |
| Gray sand | 20 | 1,199 |
| Salt water sand | 15 | 1,214 |
| Shale | 45 | 1,259 |
| Sand | 40 | 1,299 |
| Limestone and shale | 20 | 1,319 |
| Hard stone | 84 | 1,403 |

No. 8. *Oakland City Oil Area. C. D. Houchins No. 1, drilled by M. Murphy. Location: In Section 15, T. 1 S., R. 8 W.*

This record is presented on page 120.

No. 9. *Oakland City Oil Area. Joel Skinner well No. 1, drilled by Gibson and Cox. Location: In Section 3, T. 3 S., R. 8 W.*

This record is presented on page 107.

No. 10. *Oakland City Oil Area. Sarah E. Cooper No. 1 well. Location: N. W. quarter, Section 23, T. 2 S., R. 8 W.*

This record is presented on page 117.

†Oil.

The method of study used in the above plate was to plot the various records to a uniform vertical scale, one inch being equivalent to 100 feet, and using the same symbols throughout for the different formations. The top limestone of the Huron or Chester rocks was used as a basis for arranging the logs. After the plate was made, correlation lines were drawn between like formations.

The general stratigraphic section of all the fields first shows some drift or other disintegrated surface formation overlying the hard rocks, followed by the extensive series of Pennsylvanian and Mississippian rocks.

The drift was shown in records 1, 3, 4 and 7, with considerable variation in thickness. This is not essential in this study. The average drift on the Oakland City field, however, is about 50 feet.

The Pennsylvanian or "Coal Measure" rocks are distinguished by the presence of coals, interbedded with shale, limestone, and an occasional stratum of sandstone. The lower part of these rocks, characterized by an extreme thickness of massive sandstone, is obviously of the Mansfield sandstone or Pottsville age and in the Indiana records is known as the Mansfield sandstone. It marks the base of the Carboniferous series. At Sparta, along the southwestern rim of the basin, the upper division of the Pennsylvania is only 107 feet thick. This increases to about 700 feet at Greenville, in Bond County, Illinois, lying near the western edge of the basin. The thickness of the coal measures increases as the approach is made toward the center of the basin, varying from 700 to 2,200 feet. Along the eastern rim of the basin, near Oakland City, they become thin, averaging about 500 feet in that field. The Mansfield or Pottsville sandstones are the equivalent of the oil sand of Litchfield, Illinois, the Buchanan sand of the main Illinois fields, the Princeton, Indiana oil sand and the salt sand of the Oakland City field, overlying the producing sand. They maintain an extreme thickness of from 200 to 550 feet in records Nos. 1 and 4 to 10, inclusive. In record No. 2 they are very thin, owing to the wedging out toward the western rim of the basin.

The Mississippian rocks next underlie the Pennsylvanian, and are the most important in the Eastern Interior Basin, in that they are widely productive of oil. This series of rocks comprises what is known as, first, the Huron or Chester rocks, followed by the massive limestones known as the Mitchell, Oölitic and Harrodsburg limestones, which are an equivalent of the St. Louis and Spergen limestones of Illinois. None of the columnar sections show the formations below the Huron rocks.

The top limestone of the Huron rocks, and consequently of the Mississippian, is the first underlying the massive Mansfield or Pottsville sandstones. It was used in the above plate as a basis of arrangement. The remaining rocks of the Huron or Chester formation are characterized by alternating limestones, red shales—otherwise known as "red rock"—sandstones and some shale. The strongest markers of the presence of these rocks are the red shales. They particularly indicate the position of the productive oil horizons, and are becoming widely used by oil men as a guide in drilling.

The Huron or Chester series is notable for its areal extent over the basin and also as being widely productive of oil. In Illinois it contains the Sparta oil sand of Randolph County; the Lindley gas sand of Bond Township; the Benoist sand of Sandoval and the productive sand around Centralia, both locations in Marion County; the Kirkwood, Tracy, green sand, and McCloskey sands of Lawrence County. The productive sand of the Oakland City field, in Pike County, Indiana, belongs to the same formation.

The Oakland City sand is easily correlated with the Huron or Chester sands producing oil in Illinois, both by the presence of red shales and by its position, underlying the massive Pottsville sandstone. Records 8, 9 and 10 indicate the relations.

The Tracy, McCloskey and green sands of the main Illinois fields underlie the Kirkwood and are, in reality, sandy limestones, yielding oil obviously of limestone origin, since it gives a strong and offensive odor of sulphur gas. One well in the Oakland City field, in the southwest quarter of the northwest quarter of Section 13, Patoka Township, was reported to have reached a sand lower than the Oakland City sand, and to yield an oil of good gravity and of strong sulphur smell. The Oakland City sand in this well was found at 1,171 feet and was 10 feet thick. The second lens was found at 1,228 feet and was 8 feet thick. The two lenses yielded an initial production of 150 barrels. The stray sand was found at a lower depth at 1,284 feet, and was reported to be 18 feet thick, yielding the sulphur oil. This seems comparable to the Tracy sand of the Illinois field and will be held as a tentative conclusion until further information is secured.

## PRESENTATION OF LOGS.

*Section 26, Monroe Township (T. 2 S., R. 8 W.)*

On the J. Yager lease, where the original well was drilled, there are four producing wells making 80 barrels daily. The record of No. 1 is as follows:

| *Record of Yager No. 1 Well.* | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Surface, mud, loam and quicksand | 52 | 52 |
| Coal measures, shale, coal, etc. | 408 | 460 |
| Sandstones (Mansfield and Huron) salt water | 410 | 870 |
| Limestone | 30 | 900 |
| Shale | 15 | 915 |
| Limestone | 40 | 955 |
| Shale | 10 | 965 |
| Limestone | 70 | 1,035 |
| Shale | 5 | 1,040 |
| Limestone | 54 | 1,094 |
| Shale | 46 | 1,140 |
| Limestone and shale | 41 | 1,181 |
| Total depth | | 1,181 |

The last stratum in the above record is what is known to oil men as the oil bearing sand. The first gas was found at 1,148 feet and the first oil at 1,162 feet, the pay streak continuing unbroken to the bottom. Between 1,174 and 1,178 feet the well filled up 400 feet in one hour. The drilling was stopped at 1,181 feet, the sand at that depth getting white and looking wet. The record of the iron used in the well is as follows:

| Casing— | Feet. |
|---|---|
| 13 -in. | 52 |
| 10 -in. | 303 |
| 8 -in. | 960 |
| 6¼-in. | 1,074 |

This well flowed 30 barrels a day natural, i. e., without being shot, for a long while. About a year and a half after it was drilled in, it was shot and produced 100 barrels a day for several months.

No. 2 was drilled in, August 20, 1909, and gave the following partial strata record:

| | Feet. |
|---|---|
| Salt sand, (broken at intervals by shale formation) | 580– 950 |
| Lime | 1,058–1,108 |
| Red rock | 1,129–1,136 |
| Gas sand | 1,150 |
| Oil sand | 1,175 |

| | Feet. |
|---|---|
| First pay | 1,175 |
| Second pay | 1,180 |
| Total depth | 1,185 |

The casing record is:

| Casing— | Feet. |
|---|---|
| 10-in. | 90 |
| 8¼-in. | 370 |
| 6¼-in. | 1,058 |

The well was shot with 80 quarts of nitroglycerine.

No. 3, drilled in, January 2, 1910, on the same lease, has the following record:

| | Feet. |
|---|---|
| Lime | 1,056–1,096 |
| Oil sand | 1,156–1,190 |
| Total depth | 1,194 |

| Casing— | Feet. |
|---|---|
| 10-in. | 63 |
| 8¼-in. | 360 |
| 6¼-in. | 1,060 |

The only well on the M. Burnett lease, southwest quarter of the northeast quarter of the section, is the gas well. The record kept of this well is not complete. Only the formations important as casing points or markers were kept. The partial record is as follows:

| *M. Burnett Gas Well.* | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| First coal | 7 at | 85 |
| Water and coal, second vein | .. at | 170 |
| Sand | 10 at | 240 |
| Sand and water | 15 at | 290 |
| Limestone | 8 at | 313 |
| Sandstone | 20 at | 340 |
| Sandstone | 10 at | 480 |
| Sandstone | 40 at | 520 |
| Lime | 6 at | 642 |
| Sandstone | 35 at | 770 |
| Sand with water | 35 at | 835 |
| Limestone shell and slate | 165 at | 870 |
| Red rock | 8 at | 1,035 |
| Limestone | 37 at | 1,053 |
| Red rock | 10 at | 1,090 to 1,100 |
| Top of oil sand | 1,134 | |
| Showing of oil | 1,143 | |
| Gas pay | 1,146 to | 1,151 |
| Depth | | 1,152 |

The casing record here was:

| Casing— | Feet. |
|---|---|
| 12½-in. | 62 |
| 10 -in. | 636 |
| 8¼-in. | 790 |
| 6¼-in | 1,053 |
| 3 -in. tubing | 1,153 |

This well had a capacity of 5,000,000 cubic feet of gas daily, and at the start a rock pressure of 525 pounds.

The South Fork Oil Company, which owns the fee simple of what is known as the Machine Forty, just west of the J. Yager lease, northwest quarter of southwest quarter of Section 26, is operating with five producing wells. The following is the record for the same:

*South Fork Oil Company Lease.*

| Date— | No. 1. May 28, 1909. Feet. | No. 2. July 11, 1909. Feet. | No. 3. Dec. 15, 1909. Feet. | No. 4. ——— Feet. | No. 5. May 27, 1910. Feet. |
|---|---|---|---|---|---|
| Casing— | | | | | |
| 10-inch | ..... | 82 | 83 | 63 | 95 |
| 8¼-inch | ..... | 370 | 335 | 335 | 325 |
| 6¼-inch | 1,073 | 997 | 1,160 | 1,088 | 1,072 |
| Shot | 60 qts. | 60 qts. | 140 qts. | 180 qts. | ..... |

No. 1 is reported as having the following sand record:

| | Feet. |
|---|---|
| Hard shell | 1,145–1,149 |
| Sand | 1,149–1,178 |
| Gas | 1,142–1,145 |
| Best oil | 1,160–1,170 |
| Total | 1,178 |

No. 2:

| | |
|---|---|
| Lime | 997–1,058 |
| Gas sand | 1,150–1,154 |
| Slate | 1,154–1,160 |
| Top oil sand | 1,160 |
| Shell and sand | 1,160–1,189 |
| Later drilled to (total) | 1,198 |

No. 3:

| | |
|---|---|
| First sand, brown | 1,156–1,175 |
| No gas. | |
| Best oil | 1,158–1,175 |
| Slaty break | 1,175–1,181 |
| Slate and second sand | 1,191–1,194 |
| Total | 1,194 |

No. 4:

| | |
|---|---|
| Sand | 1,166–1,196* |
| Total | 1,196 |

No. 5:

| | |
|---|---|
| Gas sand | 1,144–1,152* |
| Oil sand | 1,152–1,190 |
| Total | 1,192 |

*No gas.

This lease, during the fall of 1910, produced 35 to 40 barrels daily.

On the Warrick Mason lease, southeast quarter of the southwest quarter of Section 26, Murphy & Co. are operating six wells, producing 105 barrels daily in November, 1910. The following is a record of five of them:

*W. Mason Lease.*

| Date— | No. 1. Mar. 13, 1909. Feet. | No. 2. Sept. 21, 1909. Feet. | No. 3. ——— Feet. | No. 4. Jan. 29, 1910. Feet. | No. 5. Mar. 22, 1910. Feet. |
|---|---|---|---|---|---|
| Salt sand | 600- 800 | 580- 765 | 575-850 | ..... | 580- 875 |
| Limestone | 1,067-1,104 | 1,075-1,120 | 1,081-1,121 | 1,078-1,118 | 1,080-1,120 |
| Red rock | 1,110-1,130 | 1,135-1,150 | 1,140-1,147 | ..... | 1,140-1,150 |
| Oil sand | 1,150-1,178 | 1,162-1,200 | 1,167-1,200 | 1,157-1,188 | 1,173-1,198 |
| First pay at | 1,164 | 1,175 | ..... | ..... | ..... |
| Second pay at | 1,171 | 1,190 | ..... | ..... | ..... |
| Total | 1,178 | 1,205 | 1,203 | 1,190 | 1,202 |
| Casing— | | | | | |
| 10-inch | 50 | ..... | 65 | 50 | ..... |
| 8¼-inch | 550 | ..... | 325 | 355 | ..... |
| 6½-inch | 925 | ..... | 1,081 | 1,078 | ..... |
| 4⅓-inch | 1,080 | ..... | ..... | ..... | ..... |
| Shot | ..... | 120 qts. | ..... | ..... | ..... |
| Initial production | 35 bbls. | 180 bbls. | ..... | ..... | ..... |
| Production after being shot | 90 | ..... | ..... | ..... | ..... |

On the Johnson farm, southwest quarter of southeast quarter of Section 26, Monroe Township, there are three wells now doing 85 barrels daily. The following is a record of these wells:

| Date Completed— | July 5, 1909. Feet. | Oct. 14, 1909. Feet. | Nov. 27, 1909. Feet. |
|---|---|---|---|
| Salt sand | 600– 800 | 570– 875 | 490– 840 |
| Limestone | 1,075–1,115 | 1,075–1,115 | 1,075–1,115 |
| Red rock | 1,125–1,140 | 1,140–1,145 | 1,140–1,145 |
| Oil sand | 1,159–1,189 | 1,162–1,195 | 1,165–1,197 |
| First pay at | 1,165 | ..... | 1,170 |
| Second pay at | 1,175 | ..... | 1,185 |
| Shale | ..... | 1,192–1,200 | ..... |
| Total depth | 1,189 | 1,200 | 1,197 |
| Casing— | | | |
| 10-inch | 50 | 270 | 59 |
| 8¼-inch | 420 | 875 | 390 |
| 6¼-inch | 1,035 | 1,075 | 1,080 |
| Shot | 120 qts. | 140 qts. | 140 qts. |
| Initial production | 170 bbls. | 107 bbls. | ..... |
| Present production | ..... | 50 bbls. | ..... |
| Casing, 12½-inch | ..... | 180 feet | ..... |

On the northwest corner of this lease there is a large power pumping the thirteen wells of the J. Yager, W. Mason and the Johnson leases.

Four wells on the Ferris property, southwest quarter of the southwest quarter of Section 26, were yielding 25 barrels daily. The following is a record of these wells:

| Date— | No. 1. Jan. 9, 1910. Feet. | No. 2. Mar. 12, 1910. Feet. | No. 3. May 12, 1910. Feet. | No. 4. June 16, 1910. Feet. |
|---|---|---|---|---|
| Casing— | | | | |
| 10-inch | .102 | 65 | 65 | 74 |
| 8 -inch | 467 | * | * | 358 |
| 6¼-inch | 1,084 | 1,079 | 1,083 | 1,093½ |
| Sand at | 1,160 | 1,169 | 1,165 | 1,175 |
| Thickness of sand | 29 | 25 | 25 | 25 |
| Total | 1,189 | 1,194 | 1,195 | 1,200 |
| Shot | 100 qts. | 100 qts. | 120 qts. | 100 qts. |

*Not given.

No. 1 yielded 100 barrels, natural, the first 24 hours, and 170 barrels the second 24 hours. When the well was rigged up and regulated to a 36-inch stroke it made 180 barrels in 24 hours.

On the P. S. Mason lease, southwest quarter of the southwest quarter of Section 26, there are two producing wells and one dry hole, with the following record for Nos. 2 and 3:

| Date— | No. 2. Mar. 16, 1910. Feet. | No. 3. Feet. |
|---|---|---|
| Lime | 1,059–1,109 | 1,070–1,090 |
| Broken formation | 1,164–1,169 | ..... |
| White sand | 1,179–1,185 | 1,168–1,173 |
| Oil | 1,185–1,189 | 1,173–1,195 |
| Total | 1,192 | 1,198 |
| Casing— | | |
| 10-inch | 60 | 57 |
| 8¼-inch | 315 | 297 |
| 6¼-inch | 1,059 | 1,070 |
| Shot | 120 qts. | ..... |
| Conductor | ..... | 14 |

The Ohio Oil Company drilled a dry hole on the H. Yager farm, northeast quarter of the southeast quarter of Section 26, Monroe Township, defining the eastern edge of the pool in this section. Below is the pipe record of this bore:

| Casing— | Feet. |
|---|---|
| 10-in. | 28 |
| 8¼-inch | 360 |
| 6¼-in. | 1,070 |
| Top of sand | 1,184 |
| Total depth | 1,224 |

On the C. Carlisle farm, northwest quarter of Section 26, Monroe Township, there are three producing oil wells and one gas well. The three wells were yielding, in November, fifteen barrels daily.

Two gas wells complete the list of wells in Section 26, Monroe township, one on the English farm, northeast quarter of the northwest quarter, and the other on the Wm. Harbison farm, on the northeast quarter of the northeast quarter. The following is a record of the latter:

| Casing— | Feet. |
|---|---|
| 10-in. | 27 |
| 8¼-in. | 350 |
| 6¼-in. | 1,050 |
| Some oil at | 1,154 |
| Oil sand | 1,154–1,165 |
| Limestone | 1,165–1,176 |
| Shale | 1,176–1,182 |
| Gas | 1,182–1,186 |

*Section 35, Monroe Township, T. 2 S., R. 8 W.*

In the northwest quarter of the northwest quarter of Section 35, to the south of Section 26, on the Stella Black farm, there are two wells. No. 1 has the following record:

| | Feet. |
|---|---|
| Limestone | 1,080–1,120 |
| Oil sand | 1,182–1,202 |
| Lime | 1,202–1,207 |

| Casing— | Feet. |
|---|---|
| 10-in. | 66 |
| 8¼-in. | 400 |
| 6¼-in. | 1,080 |

Completed January 31, 1910.

On the T. H. Coleman farm, southwest quarter of the northwest quarter of Section 35, Monroe Township, there is one producing well.

The Ohio Oil Company operates four wells on the northeast quarter of the same section on the W. D. Mason farm, with the following record:

*W. D. Mason Lease.*

| Date— | No. 1. July 24, 1909. Feet. | No. 2. Dec. 3, 1909. Feet. | No. 3. Feb. 25, 1910. Feet. | No. 4. Feet. |
|---|---|---|---|---|
| Casing— | | | | |
| 10-inch | 52 | 73 | 91 | 81 |
| 8¼-inch | 425 | 408 | 380 | 400 |
| 6¼-inch | 1,080 | 1,070 | 885 | 1,074 |
| Top of sand | 1,160 | 1,176 | 1,169 | 1,167 |
| Oil at | 1,170 | 1,180 | ..... | 1,169 |
| Best oil at | 1,178 | 1,185 | ..... | ..... |
| Total | ..... | 1,196 | 1,195 | 1,198 |
| Production first 24 hours | 250 bbls. | 75 bbls. | 70 bbls. | ..... |
| Second 24 hours | 250 bbls. | 50 bbls. | ..... | ..... |
| Shot | 140 qts. | 60 qts. | 80 qts. | 100 qts. |

On the T. J. Hurt lease, northeast quarter of the northwest quarter of Section 35, there are two wells producing about 18 barrels daily.

On the E. H. Ashby lease, in the same quarter section, there are two wells, one producing and one abandoned well, which had a showing of oil. Below is the record of these wells:

*Wells on E. H. Ashby Lease.*

| Casing— | No. 1. Feet. | No. 2. Feet. |
|---|---|---|
| 10 -in. | 70 | 75 |
| 8¼-in. | .. | 400 |
| 6¼-in. | 1,050 | 1,070 |
| 4⅝-in. | 1,167 | ... |
| Top of sand | 1,167 | 1,175 |
| Oil at | 1,176 | ... |
| Best oil | 1,185 | ... |
| Total | 1,209 | 1,229 |

Production, No. 1, first 24 hours, 100 bbls.; second 24 hours, 75 bbls. No. 2, dry hole.

No. 1 was completed on October 19, 1909, and No. 2 on November 27, 1909.

On the J. McKinney lease, southeast quarter of the northeast quarter of the section, a dry hole was drilled. There was also another on the E. Conner lease, northeast quarter of the southeast quarter of the section.

*Section 36, Monroe Township (T. 2 S., R. 8 W.).*

In this section the drilling has been confined to two dry holes. One on the Thos. Jordan lease, northeast quarter of southwest quarter of the section was drilled to a depth of 1,300 feet. The other, on the L. Lemasters farm, in the northeast quarter of the section, gives the following record:

| *Dry Hole on the L. Lemasters Farm.* | Feet. |
|---|---|
| Salt sand | 725– 875 |
| Limestone | 1,095–1,123 |
| Red rock | 1,160–1,180 |
| Oil sand | 1,210–1,220 |
| Yellow sand | 1,220–1,230 |
| Lime | 1,230–1,238 |
| Shale | 1,238–1,252 |
| Sand (salt water) | 1,252–1,340 |
| Sandy lime | 1,340–1,405 |
| Hard lime (Blue Lick water running over top) | 1,405–1,500 |
| Blue shale | 1,500–1,503 |
| Gray and brown lime | 1,503–1,625 |

The pipe record is as follows:

| | |
|---|---|
| Pipe, 12½-in. | 55 |
| Casing— | |
| 10 -in. | 370 |
| 8¼-in. | 875 |
| 6¼-in. | 1,390 |

*Section 34, Monroe Township (T. 2 S., R. 8 W.).*

The only test in this section was a dry hole on the Morgan farm, northwest quarter of the northwest quarter of the section, giving the following record:

*Record of Bore on the Morgan Farm.*

*(Drilled March 26, 1909.)*

| Strata. | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Mud and slate from top | .. | 370 |
| Sand containing some gas | 30 | 400 |
| Mud | 25 | 425 |
| Sand | 25 | 450 |
| Mud | 130 | 580 |
| Salt sand and water | 70 | 650 |
| Slate | 20 | 670 |
| Sand | 30 | 700 |
| Slate | 20 | 720 |
| Sand | 80 | 800 |
| Mud | 75 | 875 |
| Limestone | 10 | 885 |
| Mud | 25 | 910 |
| Sandstone | 40 | 950 |
| Mud | 15 | 965 |
| Sandstone | 105 | 1,070 |
| Mud | 15 | 1,085 |
| Lime rock, hard | 30 | 1,115 |
| Broken sand | 65 | 1,180 |
| Hard lime rock | 20 | 1,200 |
| Slate and red rock | 15 | 1,215 |
| Salt sand and water | 93 | 1,308 |
| Total depth | | 1,308 |

The casing record is as follows:

| | |
|---|---|
| Casing— | Feet. |
| 10 -in. | 105 |
| 8¼-in. | 469 |
| 6⅝-in. | 1,126 |

This bore was the farthest southwest one put down in the field, and with the Gillum well, three-quarters of a mile north and a half mile west, proves the running out of the pool in this direction.

*Section 3, Monroe Township (T. 3 S., R. 8 W.).*

Among the early wildcat bores drilled soon after the drilling of the Yager No. 1 well, was one by Gibson & Cox on the Joel Skinner lease, northeast quarter of the northeast quarter of Section 3, Monroe Township. This location was about a mile and a quarter south and a half mile west of the Yager No. 1. The result was a dry hole with a very small showing of oil. The record is as follows:

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Clay | 20 | 20 |
| Shale | 60 | 80 |
| Sand-water | 5 | 85 |
| Shale | 50 | 135 |
| Sand | 80 | 215 |
| More water at | .. | 150 |
| Shale | 135 | 350 |
| Coal | 2 | 352 |
| Shale | 168 | 490 |
| Shelly limestone | 30 | 520 |
| Sand | 40 | 560 |
| Shale | 10 | 570 |
| Sand and water | 20 | 590 |
| Shale | 40 | 630 |
| Salt sand | 205 | 835 |
| Shale | 75 | 910 |
| Sand (water 920) | 25 | 935 |
| Sandy lime | 25 | 960 |
| Shale | 10 | 970 |
| Pure black shale | 25 | 995 |
| Rotten shale | 5 | 1,000 |
| Slate | 45 | 1,045 |
| Limestone | 8 | 1,053 |
| Sandy slate | 10 | 1,063 |
| Lime | 23 | 1,086 |
| Sand and water | 13 | 1,099 |
| Slate | 11 | 1,110 |
| Slate | 5 | 1,115 |
| Red rock | 5 | 1,120 |
| Slate | 5 | 1,125 |
| Red rock | 8 | 1,133 |
| Slate | 24 | 1,157 |
| Lime | 45 | 1,202 |
| Shale | 12 | 1,214 |
| Red rock | 5 | 1,219 |
| Black shale | 15 | 1,234 |
| Sandstone shells | 3 | 1,237 |
| Sand, dry (oil showing) | 8 | 1,245 |

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Sand | 6 | 1,251 |
| Break of muddy shale | 3 | 1,254 |
| Sand, oil showing | 11 | 1,265 |
| Sand, salt water | 15 | 1,280 |
| Lime | 10 | 1,290 |
| Slate | 15 | 1,305 |
| Sand | 7 | 1,312 |
| Slate | 21 | 1,333 |
| Sandy shale | 10 | 1,343 |

At 1,343 feet water was struck which flowed over the top of the hole and the well was abandoned.

*Section 2, Monroe Township (T. 3 S., R. 8 W.).*

The only attempt in this section was on the Grubb farm, fully two miles south of any production. The result was a dry hole, with the following record:

*Dry Hole on the Grubb Farm.*

| | Feet. |
|---|---|
| Red rock | 1,125–1,140 |
| Limestone | 1,140–1,182 |
| Shale | 1,182–1,242 |
| Limestone | 1,242–1,260 |
| Shale | 1,260–1,305 |
| Limestone | 1,305–1,345 |
| Shale | 1,345–1,375 |
| Sand | 1,375–1,385 |
| Limestone | 1,385–1,388 |
| Blue lick | 1,388–1,392 |

| Casing— | Feet. |
|---|---|
| 10 -in. | 67 |
| 8¼-in. | 400 |
| 6¼-in. | 940 |
| 4⅞-in. | 1,098 |
| Total | 1,392 |

*Section 28, Monroe Township (T. 2 S., R. 8 W.).*

The only drilling in this section was a test bore on the Gillum lease, southwest quarter of the section, two miles west of the Yager well, which came in a dry hole, with the following record:

*Record of Bore on the Gillum Lease.*

| | Feet. |
|---|---|
| Drive pipe, 10-in. | 50 |
| Casing— | |
| 8¼-in. | 330 |
| 6¼-in. | 1,120 |
| Top of sand | 1,186 |
| Total depth | 1,210 |

Here a four-foot vein of coal was passed through at a depth of 154 to 158 feet; another one of six feet thick at 190-196 feet, and a five-foot vein of red rock at 1,174 feet.

On the J. F. Cato farm, northeast quarter of the northeast quarter, there are three very light producing wells.

*Section 27, Monroe Township (T. 2 S., R. 8 W.).*

On the J. Yager farm, southeast of the southeast quarter of Section 27, there have been three bores put down. Two of these are fair producing wells and the third a light producing well.

On the Ettie Simpson lease, southwest quarter of the southeast quarter of Section 27, Monroe Township, there are two wells. The record of No. 1 is as follows:

| | Feet. |
|---|---|
| Wood conductor | 20 |
| Casing— | |
| 10 -in. | 83 |
| 8¼-in. | 404 |
| 6¼-in. | 1,065 |
| Small vein of coal at | 75 |
| Four feet of coal at | 210 |
| Salt sand | 515 |
| Oil sand | 1,167 |
| Total depth | 1,185 |

On the J. S. Kays farm, northeast of southwest quarter of Section 27, there was a bore put down which was practically a dry hole, but with a showing of oil. The record of this well is as follows:

*Record of Well on J. S. Kays Farm.*

(Completed August, 1910.)

| | Feet. |
|---|---|
| Limestone | 1,064–1,098 |
| Oil sand | 1,155–1,177 |
| Casing— | |
| 10 -in. | 33 |
| 8¼-in. | 360 |
| 6¼-in. | 1,064 |

On the J. E. Mason lease, northeast quarter of the southeast quarter of Section 27, Monroe Township, Murphy & Co. drilled in one fair producing well, with the following record:

(Date completed, May 10, 1909.)

| | Feet. |
|---|---|
| Lime | 1,080–1,116 |
| Shale | 1,116–1,142 |
| Top of sand at | 1,142 |
| First pay at | 1,161 |
| Most oil at | 1,166 |
| Total depth | 1,173 |
| Shot | 60 qts. |

At 1,161 feet, where first pay was reached, the oil filled to 30 feet above the tools. The drilling was stopped in the sand when the latter began to look like water sand. The casing record of this well is:

| | Feet. |
|---|---|
| Wooden conductor | 14 |
| Casing— | |
| 10 -in. | 70 |
| 8¼-in. | 455 |
| 6⅝-in. | 1,081 |

On the T. J. English farm, southeast of northeast of Section 27, one well with an initial production of 40 barrels, was put down, with the following record:

(Drilled April 9, 1909.)

| Casing— | Feet. |
|---|---|
| 10 -in. | 75 |
| 8¼-in. | 460 |
| 6⅝-in. | 1,080 |
| Sand | 1,136 –1,154½ |
| Oil showing | 1,154½ |
| Shale break | 1,154½–1,171 |
| Pay sand | 1,171 –1,177 |
| Shot | 100 qts. |

Drilling was stopped in sand which was running white but was shot into water. This well has recently been abandoned.

The Amelia Skinner lease, southeast quarter of northeast quarter of the section and one-half mile northwest of the Yager well, there are three producing wells. The record of No. 1, completed December 25, 1908, and therefore the third producing well in the field, is as follows:

| | Feet. |
|---|---|
| Drive pipe, 10-in. | 60 |
| Casing— | |
| 8¼-in. | 417 |
| 6¼-in. | 1,067 |
| Depth to top of sand | 1,130 |
| Depth to pay sand | 1,139 |
| Total depth | 1,178 |
| Initial production, bbls. | 100 |

Gas was found in the sand between 1,130 and 1,139 feet. From 1,139 to 1,169 feet the sand was quite porous, and between these depths most of the oil was produced. This well made 2,350 barrels of oil from the time it was drilled in, up to May, 1909, when the Pure Oil Company put in its pipe line.

On the H. Henning lease there are six wells producing 40 barrels daily. The following is a record of three of these:

| Date Completed— | No. 1. June 23, 1909. Feet. | No. 2. Dec. 2, 1909. Feet. | No. 3. Feet. |
|---|---|---|---|
| Salt sand | ..... | 490–1,015 | ..... |
| Limestone | 1,072–1,102 | 1,075–1,100 | 1,063–1,091 |
| Red rock | 1,115–1,121 | 1,115–1,120 | 1,110–1,120 |
| Gas sand | 1,134–1,146 | 1,129–1,146 | ..... |
| Oil sand | 1,160–1,173 | 1,153–1,170 | 1,133–1,170 |
| Oil at | 1,160 | 1,158 | 1,162 |
| Total | 1,173 | 1,170 | 1,170 |
| Fresh water | ..... | 100 | ..... |
| Wood conductor | 12 | ..... | ..... |
| Casing— | | | |
| 10-inch | 70 | 72 | 50 |
| 8¼-inch | 400 | 330 | 335 |
| 6¼-inch | 1,072 | 1,075 | 1,066 |

In the northwest quarter of the northeast quarter of the Grant Black lease there are three wells, the record of two of them showing:

*Record of Wells on the Grant Black Farm.*

| Date Completed— | No. 2. Apr. 11, 1910. Feet. | No. 3. Feet. |
|---|---|---|
| Salt sand | 525– 700 | 520– 895 |
| Limestone | ..... | 1,172–1,102 |
| Red rock | 1,115–1,125 | none |
| Gas sand | 1,135–1,140 | none |
| Shaly break | 1,140–1,155 | ..... |
| Oil sand | 1,155–1,170 | 1,151–1,171 |
| Total | 1,170 | 1,171 |
| Casing— | | |
| 10-inch | 46 | 96 |
| 8¼-inch | 330 | 330 |
| 6¼-inch | 1,073 | 1,076 |

On the J. B. Cato lease, northwest quarter of Section 27, Monroe Township, there are three small producing wells. An incomplete record of Well No. 1, furnished by Wm. E. Thompson, contractor, showed: Wooden conductor, 15 feet to sandstone; 89 feet of 10-inch casing through sand to shale. Passed through a small vein of coal at 70 feet; 383 feet of 8¼-inch casing through shale and sandstone formations and cavy, rotten shale to solid shale; 1,072 feet of 6¼-inch casing, through 400 feet of salt sand to almost 900 feet, and then through breaks of shale and limestone shells to more than a thousand feet, and through three limestone formations from 12 to 15 feet in thickness, with breaks between 1,072 feet, where the 6¼ was placed on 15 feet of limestone. The formation was a brown slate to within 6 feet of the oil sand, when a black shale was passed through. Twenty-one feet of pay sand was found at a depth of 1,165 feet 6 inches. The well was drilled two feet below pay into salt sand when the well partly filled up with water. This lease was producing 10 barrels daily in November, 1910.

*Section 21, Monroe Township (T. 2 S., R. 8 W.).*

On the English farm, southeast of southeast of the section, there are three wells producing five barrels daily.

On the southeast corner of the above quarter section, on the English five-acre lease, there is one small producing well.

On the Kohlmyer lease the Crescent Oil Company, a local company, is operating two wells whose record is as follows:

| | No. 1. Feet. | No. 2. Feet. |
|---|---|---|
| Casing— | | |
| 10-inch | 100 | 100 |
| 8 -inch | 480 | 495 |
| 6¼-inch | 1,082 | 1,082 |
| Sand | 1,151–1,172 | 1,146–1,168 |
| Total | 1,172 | 1,168 |
| Shot | 80 qts. | 80 qts. |

No. 1 made a little gas and considerable water and No. 2 produced a great deal of gas and some water. The two wells were producing 15 barrels daily in November.

*Section 22, Monroe Township (T. 2 S., R. 8 W.).*

On the W. Lindsay farm, southwest of southwest of the section, there is one very light producing well. On the W. Shy lease, northwest of southwest of the section, there are two light producing wells and one fair producer, all making 13 barrels daily.

On the Emmaline Miller farm, in the southeast quarter of the southwest quarter of the section, there is one well with the following record:

(Date completed, June 13, 1910.)

| | Feet. |
|---|---|
| Limestone | 1,091–1,120 |
| Hard shelly formation | 1,151–1,154 |
| Sand | 1,154–1,168 |
| Best oil | 1,154–1,159 |
| Total | 1,169 |

On the Oliver Mason lease, in the southwest of the southwest, there are two producing wells and two dry holes, with a light showing of oil. The following is a record of No. 1 and No. 4:

| Date Completed— | No. 1. Mar. 4, 1910. Feet. | No. 4. Aug. 2, 1910. Feet. |
|---|---|---|
| Salt sand | 540– 850 | ..... |
| Limestone | 1,080–1,100 | 1,076–1,080 |
| Red rock | 1,115–1,120 | ..... |
| Gas sand | 1,142–1,150 | 1,140–1,150 |
| Oil sand | 1,150–1,173 | 1,115–1,179 |
| Pay | 1,165 | Small show at 1,175 |
| Total | 1,173 | 1,179 |
| Conductor | 12 | ..... |
| Casing— | | |
| 10-inch | 52 | 81 |
| 8¼-inch | 340 | 320 |
| 6¼-inch | 1,090 | 1,078 |

No. 4 was practically dry and was plugged.

On the Emmaline Miller farm, in the southeast quarter of the section and across the east line of the Oliver Mason lease, there are four producing wells making 15 barrels daily.

On the C. D. Houchens lease, northeast of the northeast of the section, a dry hole was put down.

On the Bertha Williams lease, in the northwest quarter of the section, three bores were put down. No. 1 produced some oil and a great deal of gas. No. 2 is a light producing well. The lease was making two barrels daily in November.

*Section 23, Monroe Township (T. 2 S., R. 8 W.).*

On the McCreary farm, southwest quarter of the southwest quarter of the section, a bore was sunk, with a gas well as the result.

On the S. Thompson lease, north half of the northwest quarter of Section 23, the Ohio Oil Company has put down five holes, with the following results:

| Date Completed— | No. 1. Feet. | No. 2. Feet. | No. 3. May 25, 1910. Feet. | No. 4. Aug. 30, 1910. Feet. | No. 5. Feet. |
|---|---|---|---|---|---|
| Casing— | | | | | |
| 10-inch | 25 | 42 | 36 | 28 | 21 |
| 8¼-inch | 425 | 400 | 345 | 360 | 356 |
| 6¼-inch | 1,070 | 1,085 | 1,085 | 1,097 | 1,148 |
| 4¼-inch | 1,161 | ..... | ..... | ..... | ..... |
| Top sand | 1,143 | 1,148 | 1,151 | 1,181 | 1,148 |
| Gas | * | 1,148 | 1,155 | ..... | 1,150 |
| Oil | ..... | 1,154 | 1,165 | 1,184 | ..... |
| Best oil | ..... | 1,160 | ..... | 1,221 | ..... |
| Total | 1,161 | 1,193 | 1,188 | 1,225 | 1,276 |
| Shot | ..... | 180 qts. | 140 qts. | 80 qts. | Dry |
| First 24 hours | ..... | ..... | 2 bbls. | 12 bbls. | ..... |
| Second 24 hours | ..... | ..... | 5 bbls. | ..... | ..... |

*All gas sand.

No. 1 was a gas well.

On the W. S. Burnett farm, southwest quarter of the southeast quarter, Murphy & Co. drilled their second gas well, with the accompanying record:

(Date completed, January 17, 1910.)

| | Feet. |
|---|---|
| Salt sand | 530– 900 |
| Limestone | 1,065–1,103 |
| Red rock | 1,120–1,124 |
| Gas sand | 1,135–1,160 |
| Total | 1,160 |
| Casing— | |
| 10 -in. | 62 |
| 8¼-in. | 340 |
| 6¼-in. | 1,068 |

This well was gauged soon after being drilled, and its volume estimated at 8,000 cubic feet.

On the W. S. Burnett 80 acres, to the north of the above lease, two more gas wells were drilled.

On the F. Butler lease, partly in the southeast quarter of Section 24, there is one gas well and three producing wells. The following is the record for these wells:

*Record of Wells on the F. Butler Lease.*

| Date Completed— | No. 1. Feet. | No. 2. Oct. 29, 1909. Feet. | No. 3. Dec. 21, 1909. Feet. | No. 4. Feet. |
|---|---|---|---|---|
| Salt sand | ..... | ..... | 550- 820 | ..... |
| Limestone | ..... | 1,060–1,100 | 1,036–1,106 | 1,060–1,100 |
| Red rock | ..... | 1,120–1,125 | none | ..... |
| Oil sand | 1,157–1,169 (gas) | 1,135–1,144 | 1,138–1,170 | 1,137–1,170 |
| Brown sand | ..... | 1,144–1,165 | ..... | ..... |
| Lighter sand | ..... | 1,165–1,170 | ..... | ..... |
| Black shale | 1,169–1,172 | 1,175–1,178 | 1,170–1,198 | ..... |
| Total | 1,172 | 1,178 | 1,198 | 1,176 |
| Fresh water | ..... | 70 | 50 and 80 | ..... |
| Conductor | ..... | ..... | 14 | ..... |
| Casing— | | | | |
| 10-inch | ..... | 80 | 84 | 81 |
| 8¼-inch | 555 | 430 | 350 | 372 |
| 6¼-inch | 1,072 | 1,072 | 1,062 | 1,072 |

No. 1 is a gas well.

On the J. S. Clifford heirs' lease, west half of northwest quarter of Section 23, there are two producing wells. The record of No. 1, drilled January 4, 1910, is as follows:

| | Feet. |
|---|---|
| Limestone | 1,127–1,162 |
| Oil sand | 1,192–1,242 |
| Total depth | 1,242 |
| Casing— | |
| 10 -in. | 56 |
| 8¼-in. | 400 |
| 6¼-in. | 1,130 |

On the Sarah E. Cooper farm, northwest quarter of Section 23, there is one well with the following record:

*Record of Well on Sarah E. Cooper Lease.*

(Date completed, March 9, 1910.)

| | Feet. |
|---|---|
| Salt sand | 615– 810 |
| Limestone | 1,095–1,130 |
| Shale | 1,130–1,143 |
| Red rock | 1,143–1,148 |
| Shale | 1,148–1,160 |
| Oil sand | 1,160–1,210 |
| First pay | 1,162 |
| Fresh water | 63 |
| Conductor | 13 |
| Casing— | |
| 10 -in. | 40 |
| 8¼-in. | 473 |
| 6¼-in. | 1,105 |

On what is known as the Spindle-top church-lot lease, Twitchell & McFadden put down three wells, two in the southwest of Patoka Township and the other in the northwest quarter of the above section. No. 1 and No. 2 started in as gushers for this field and caused much of the activity in the north part of the field. No. 1 started at 200 barrels and No. 2 at 500 barrels. In No. 1 they got the sand at 1,182 feet and a shale break from 1,190 to 1,195 feet, then sand again from 1,195 to 1,236 feet. No. 3 was a light producer, starting in at 30 barrels. All three were producing only 30 barrels daily in November, 1910:

On the W. J. Rodgers lease, northeast of northeast of the section, there are two producing wells. The record of No. 1 is as follows:

| Casing— | Feet. |
|---|---|
| 10 -in. | 20 |
| 8¼-in. | 420 |
| 6¼-in. | 1,120 |
| Salt sand at | 275 |
| Limestone at | 1,015 |
| Red rock at | 1,110 |
| Oil sand at | 1,192 |
| First pay | 1,200–1,227 |
| Shot | 120 qts. |

On the J. Cooper nine acres, northeast quarter of the northeast of Section 23, Monroe Township, there is one producing well and one abandoned well that had a showing of oil. The record of the two shows:

| Date Completed— | No. 1. Aug. 17, 1909. Feet. | No. 2. Oct. 11, 1909. Feet. |
|---|---|---|
| Salt sand | 550–1,075 | ..... |
| Lime | 1,075–1,120 | ..... |
| Red rock | 1,150–1,165 | ..... |
| Oil sand | 1,165–1,195 | 1,156–1,160 (Showing of oil) |
| Shaly break | ..... | 1,160–1,170 |
| Gray sand | ..... | 1,170–1,175 |
| Black slate | ..... | 1,175–1,198 |
| Total | 1,195 | 1,198 |
| Casing— | | |
| 10-inch | 60 | 13 |
| 8¼-inch | 485 | 410 |
| 6¼-inch | 1,092 | 1,080 |
| Shot | 120 qts. | Dry and plugged. |

The initial production of No. 1 was 178 barrels, and it is now doing 18 barrels daily.

In the southeast of the northeast of Section 23, and in the west half of the northwest quarter of Section 24 is the M. Skinner lease, on which the second producing well in the field was drilled. There are now seven producing wells and one gas well on the lease, altogether making 50 barrels daily. The records of Nos. 1, 2 and 3 are as follows:

*Record of Wells on M. Skinner Lease.*

| | No. 1. Feet. | No. 2. Feet. | No. 3. Feet. |
|---|---|---|---|
| Drive pipe, 12½-inch | 57 | 73 | 98 |
| Casing— | | | |
| 10-inch | 320 | ..... | ..... |
| 8¼-inch | 785 | 510 | 490 |
| 6¼-inch | 1,055 | 1,057 | 1,080 |
| Depth to top of sand | 1,146 | 1,137 | 1,161 |
| Depth to pay sand | 1,154 | 1,149 | 1,173 |
| Total depth | 1,196 | 1,206 | 1,207 |
| Production first 24 hours (bbls.) | 33 | 75 | 35 |
| Number quarts nitroglycerin used in shooting | 40 | 60 | 100 |

Bore No. 3 showed quite a quantity of gas, the rock pressure being about 150 pounds, and has since been used as a gas well.

*Section 24, Monroe Township (T. 2 S., R. 8 W.).*

In the north half of this section, on the Peoples' State Bank lease, there are two wells producing 5 barrels daily.

A dry hole was put down on the Williams lease, southeast of northwest of the section, with the following record:

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Yellow clay | 20 | 20 |
| Gravel | 10 | 30 |
| Blue shale | 30 | 60 |
| Water sand | 45 | 105 |
| Shale | 5 | 110 |
| Limestone | 10 | 120 |
| Shale | 10 | 130 |
| Coal | 5 | 135 |
| Limestone | 3 | 138 |
| Shale | 110 | 248 |
| Limestone | 15 | 263 |
| Shale | 230 | 493 |
| Limestone | 7 | 500 |
| Shale | 175 | 675 |
| Salt sand | 240 | 875 |
| Shale | 55 | 930 |
| Salt sand | 75 | 1,005 |
| Limestone | 15 | 1,020 |
| Sand | 30 | 1,050 |
| Shale | 25 | 1,075 |
| Red rock | 5 | 1,080 |
| Limestone | 30 | 1,110 |
| Shale | 20 | 1,140 |
| Red rock | 4 | 1,144 |
| Shale | 44 | 1,188 |
| Broken sand and slate | 42 | 1,230 |
| Salt sand | .. | 1,235 |

A dry hole was also sunk on the James Farmer lease, northeast of southeast of the section, to a depth of 1,265 feet. The sand was found at 1,245 feet. The drill went into salt sand and the hole filled with water.

*Section 15, Patoka Township (T. 2 S., R. 8 W.).*

In the northwest quarter of this section Murphy & Co. put down their first drill in November, 1907. The result was a practically dry hole, with a very small showing of oil.

*Record of C. Houchen's well No. 1, Pike County, Indiana.*

(Commenced July 26, 1907; finished November 15, 1907.)

Western Engineering & Contracting Co., Fort Wayne, Ind., contractors.

| Casing— | Feet. |
|---|---|
| 12½-in. | 25 |
| 10 -in. | 833 |
| 8¼-in. | 1,130 |
| 6¼-in. | 1,422 |

| Formations. | Top. | No. Feet. | Bottom. |
|---|---|---|---|
| Clay, etc | 0 | 25 | 25 |
| Sand | 25 | 15 | 40 |
| Coal | 40 | 5 | 45 |
| Sand | 45 | 55 | 100 |
| Slate | 100 | 60 | 160 |
| Coal | 160 | 5 | 165 |
| Slate | 165 | 35 | 200 |
| Lime | 200 | 22 | 222 |
| Sand | 222 | 25 | 247 |
| Slate | 247 | 40 | 287 |
| Lime | 287 | 10 | 297 |
| Slate | 297 | 68 | 365 |
| Sand | 365 | 79 | 444 |
| Shale | 444 | 44 | 488 |
| Coal | 488 | 6 | 494 |
| Shale | 494 | 6 | 500 |
| Sand | 500 | 135 | 635 |
| Shale | 635 | 18 | 653 |
| Sand | 653 | 181 | 834 |
| Shale | 834 | 36 | 870 |
| Sand | 870 | 185 | 1,055 |
| Lime | 1,055 | 10 | 1,065 |
| Slate | 1,065 | 3 | 1,068 |
| Lime | 1,068 | 4 | 1,072 |
| Slate | 1,072 | 5 | 1,077 |
| Lime | 1,077 | 3 | 1,080 |
| Slate | 1,080 | 4 | 1,084 |
| Lime | 1,084 | 6 | 1,090 |
| Slate | 1,090 | 5 | 1,095 |
| Sand | 1,095 | 35 | 1,130 |
| Slate | 1,130 | 30 | 1,161 |
| Sand | 1,161 | 1 | 1,162 |
| Lime | 1,162 | 23 | 1,185 |
| Slate | 1,185 | 5 | 1,190 |
| Lime | 1,190 | 5 | 1,195 |
| Shale | 1,195 | 65 | 1,260 |
| Lime | 1,260 | 5 | 1,265 |
| Shale | 1,265 | 10 | 1,275 |
| Salt sand | 1,275 | 12 | 1,287 |
| Salt sand | 1,287 | 19 | 1,306 |
| Shale | 1,306 | 8 | 1,314 |
| Shale | 1,314 | 16 | 1,330 |
| Sand | 1,330 | 77 | 1,407 |
| Lime | 1,407 | 15 | 1,422 |
| Lime | 1,422 | 22 | *1,444 |

*Total depth.

On the Perigo lease, northeast quarter of the southeast quarter of the section, three extremely light producing wells were put down and later abandoned.

In the northeast of the northeast of the section, on the S. E. Houchens farm, three producing wells have been drilled, with the following record for Nos. 1 and 2:

| Date Completed— | No. 1. Oct. 15, 1910. Feet. | No. 2. Nov. 11, 1910. Feet. |
|---|---|---|
| Lime | 1,140–1,154 | 1,109–1,117 |
| Red rock | ..... | ..... |
| Top of oil sand | 1,180 | 1,168 |
| Brown oil sand | 1,183–1,193 | 1,172–1,188 |
| Hard watery sand | 1,193–1,196 | ..... |
| Shale break | 1,205–1,209 | 1,188–1,192 |
| Black oily sand | 1,209–1,217 | ..... |
| Black shale | 1,217–1,220 | ..... |
| Initial production | 75 bbls. | 75 bbls. |
| Conductor | 12 ft. | ..... |
| Casing— | | |
| 10-inch | 157 ft. | ..... |
| 8¼-inch | 560 ft. | ..... |
| 6¼-inch | 1,142 ft. | ..... |
| Shot | ..... | 60 qts. |

*Section 14, Patoka Township (T. 2 S., R. 8 W.).*

On the southwest quarter of the southwest quarter of the section on the Hoover farm there are three producing wells, with the following record for two of them:

| | No. 1. Feet. | No. 2. Feet. |
|---|---|---|
| Casing— | | |
| 10-inch | 18 | 36 |
| 8¼-inch | 420 | 435 |
| 6¼-inch | 1,123 | 1,124 |
| Shot | 180 qts. | 160 qts. |
| Lime | ..... | 1,122–1,157 |
| First sand, brown | 1,180–1,193 | 1,190–1,200 |
| Second sand, fine gray, oil bearing | 1,217–1,226 | 1,210–1,228 |
| Total | 1,226 | 1,228 |

No. 2 had a five-foot break from 1,200 to 1,205, and from 1,205 to 1,210 was a mixture of sand and shale.

On the J. D. Grimes lease, immediately to the north of the above, in the southwest quarter of the section, there are three wells producing 130 barrels. The following are the records for Nos. 1 and 2:

| Date Completed— | No. 1. Mar. 22, 1910. Feet. | No. 2. May 3, 1910. Feet. |
|---|---|---|
| Lime | 1,096–1,145 | 1,098–1,133 |
| Oil sand | 1,195–1,204 | 1,162–1,190 |
| Total | 1,204 | 1,190 |
| Conductor | 14 | ..... |
| Casing— | | |
| 10-inch | 68 | 85 |
| 8¼-inch | 550 | 400 |
| 6¼-inch | 1,098 | 1,098 |

There are nine producing wells on the W. Kays lease in the east half of the southwest quarter of Section 14. In the summer of 1910 seven of these wells were producing 140 barrels daily.

On the Mary E. Coleman lease, in the northwest of southwest, and in the southeast quarter of the northwest quarter of the section, there are also nine producing wells which, in November, were yielding 130 barrels daily. The record for five of these is as follows:

| Date Completed— | No. 1. Apr. 26, 1910. Feet. | No. 2. May 19, 1910. Feet. | No. 3. June 14, 1910. Feet. | No. 4. May 31, 1910. Feet. | No. 5. June 27, 1910. Feet. |
|---|---|---|---|---|---|
| Salt sand | 585– 610 | ..... | 585– 605 | ..... | ..... |
| Limestone | 1,090–1,142 | 1,090–1,130 | 1,089–1,131 | 1,115–1,150 | 1,102–1,132 |
| Oil sand | 1,174–1,200 | 1,155–1,188 | 1,152–1,208 | 1,185–1,218 | 1,170–1,221 |
| Total | 1,200 | 1,188 | 1,208 | 1,218 | 1,221 |
| Fresh water | ..... | ..... | 60 | ..... | 70 |
| Casing— | | | | | |
| 10-inch | 18 | 20 | 30 | 90 | ..... |
| 8¼-inch | 318 | 330 | 360 | 420 | ..... |
| 6¼-inch | 1,090 | 1,090 | 1,089 | 1,119 | ..... |
| Conductor | ..... | ..... | ..... | 14 | ..... |

On the J. Nixon farm, in the west half of the southeast quarter of Section 14, the Nixon Oil Company drilled in their famous gas well which supplies Oakland City with gas for fuel. Later, pro-

ducing oil wells were also completed. No. 4, however, proved practically a dry hole, but made enough gas to warrant its being made into a gas well. The two producing wells are making five barrels daily. The drilling record of the lease follows:

*Record of Wells on the Nixon Lease.*

| | No. 1. Feet. | No. 2. Feet. | No. 3. Feet. | No. 4. Feet. |
|---|---|---|---|---|
| Casing— | | | | |
| 10-inch | 30 | 40 | 32 | 125 |
| 8¼-inch | 380 | 454 | 440 | 440 |
| 6¼-inch | 1,120 | 1,092 | 1,100 | 1,105 |
| Top of sand | 1,192 | 1,165 | 1,166 | 1,177 |
| Gas sand to | 1,103 | 1,175 | 1,181 | 1,193 |
| Shale break to | 1,107 | 1,183 | 1,186 | ..... |
| Oil sand to | ..... | 1,209 | 1,215 | 1,271 |
| Total | 1,107 | 1,211 | 1,220 | 1,286 |
| Shot | ..... | 140 qts. | ..... | Dry |

In the northwest quarter of the southeast quarter of the section, on the J. Kays lease, there is a gas well.

On the southwest quarter of the northwest quarter of the section, on the Fred Wiggs lease, there are five producing wells and one drilling well. These wells are producing from 95 to 100 barrels daily. The record for four of these wells is as follows:

*Record of Wells on the Fred Wiggs Lease.*

| | No. 2. Feet. | No. 3. Feet. | No. 4. Feet. | No. 5. Feet. |
|---|---|---|---|---|
| Lime | 1,100–1,140 | 1,110–1,140 | ..... | 1,101–1,138 |
| Sand | 1,167–1,170 | 1,174–1,217 | 1,157–1,212 | 1,163–1,224 |
| Total | 1,200 | 1,217 | 1,212 | 1,224 |
| Casing— | | | | |
| 10-inch | 84 | 76 | 72 | 110 |
| 8¼-inch | 460 | 445 | 400 | 410 |
| 6¼-inch | 1,106 | 1,110 | 1,107 | 1,101 |
| Initial production | 260 bbls. | 100 bbls. | ..... | ..... |

On the D. C. Barrett lease, in the southwest of the northeast of the section, there is also one producing well making ten barrels daily.

The Primo Oil Company, a local company, operates six wells on the J. P. Harkness lease, Patoka Township, northwest of northwest of Section 14. They have the following records:

| Date Finished— | No. 1. May 11, 1910. Feet. | No. 2. June 11, 1910. Feet. | No. 3. June 30, 1910. Feet. | No. 4. Aug. 5, 1910. Feet. | No. 5. Sept.24, 1910. Feet. | No. 6. Oct. 7, 1910. Feet. |
|---|---|---|---|---|---|---|
| Conductor | 13 | ..... | ..... | ..... | ..... | ..... |
| Casing— | | | | | | |
| 10-inch | 90 | 80 | 88 | 88 | 160 | 128 |
| 8¼-inch | 434 | 420 | 410 | 395 | 460 | ..... |
| 6¼-inch | 1,105 | 1,089 | 1,122 | 1,100 | 1,114 | 1,129 |
| Shot | 200 qts. | 240 qts. | 140 qts. | 180 qts. | ..... | 170 qts. |
| Lime | 1,100–1,135 | 1,087–1,117 | 1,120–1,150 | 1,097–1,125 | 1,114–1,101 | 1,127–1,162 |
| First sand | 1,161–1,201 | 1,156–1,207 | 1,190–1,205 | 1,151–1,198 | 1,180–1,193 | 1,195–1,208 |
| Gas | ..... | 1,196–1,200 | ..... | ..... | ..... | ..... |
| Shaly break | ..... | ..... | 1,205–1,211 | ..... | 1,193–1,199 | 1,193–1,199 |
| Second sand | ..... | ..... | 1,211–1,231 | ..... | 1,199–1,230 | 1,213–1,285 |
| Total | 1,201 | 1,207 | 1,231 | 1,198 | 1,230 | 1,240 |

In No. 6, a gas break was reported below the second sand from 1,234 to 1,240 feet. This lease, in November, 1910, was producing 100 barrels daily.

The Primo Oil Company also operates three wells on the F. Bruce lease, in the northeast of the northwest of the section, their records being as follows:

| Date Completed— | N. 1. June 9, 1910. Feet. | No. 2. July 11, 1910. Feet. | No. 3. Sept. 24, 1910. Feet |
|---|---|---|---|
| Conductor | ..... | 12 | 8 |
| Casing— | | | |
| 10-inch | 80 | 76 | 106 |
| 8¼-inch | 435 | 130 | 415 |
| 6¼-inch | 1,102 | 1,110 | 1,118 |
| Shot | 200 qts. | 160 qts. | ..... |
| Lime | 1,100–1,137 | 1,107–1,147 | 1,119–1,149 |
| First sand | 1,159–1,205 | 1,172–1,188 | 1,178–1,235 |
| Shaly break | ..... | 1,188–1,193 | ..... |
| Second sand | ..... | 1,193–1,210 | ..... |
| Total | 1,205 | 1,210 | 1,235 |
| First 24 hours production | 175 bbls. | | |

The Crude Oil Company, also a local company, is operating three wells on the Kern lease, northeast of northwest of Section 14, Patoka Township. The record of No. 3 on this lease is as follows:

| Casing— | Feet. |
|---|---|
| 10 -in. | 130 |
| 8¼-in. | 440 |
| 6¼-in. | 1,128 |
| Brown sand | 1,188–1,206 |
| Slaty break | 1,206–1,211 |
| White sand | 1,211–1,236 |
| Total | 1,238 |

This well was a small producer, and gas was found in the first screw of brown sand, both gas and oil in the white and.

No. 1, on this lease, having about the same casing record but 20 feet shallower, had an initial output of more than 100 barrels a day, and in November was producing 15 barrels.

On the C. D. Houchens lease, in the northeast of the northwest of the section, there are also two producing wells.

On the H. P. Beatty farm, east half of the northeast quarter of the section, a gas well was drilled November 13, 1910. This well was drilled soon after the well on the Brown farm, northwest quarter of Section 13, which had reopened a portion of the field already abandoned, by drilling into a deeper sand. The Beatty well came in a roaring gas well and was quite a surprise, as the location is only 400 feet from the Brown well. The capacity of the well when first drilled was estimated at 12,000,000 feet. The pressure was so great that it drilled itself into salt sand and the pressure became smaller because of the gas being drowned out by salt water. On November 19 the well was gauged and showed 475 pounds' rock pressure and the daily capacity being then estimated at 2,500,000 cubic feet. The following is the pipe and sand record for the Beatty well:

| Casing— | Feet. |
|---|---|
| 10 -in. | 146 |
| 8 -in. | 400 |
| 6¼-in. | 1,107 |
| Oakland City sand | 1,176–1,183 |
| Broken formation | 1,183–1,218 |
| Limestone at | 1,218 |
| Second sand | 1,232–1,243 |

*Section 13, Patoka Township (T. 2 S., R. 8 W.).*

The first bore put down in this section was on the Brown farm, in the southeast quarter of the northwest quarter in March, 1910. The result here was much the same as in the foregoing Beatty well. At a depth of 1,243 feet gas was struck and the capacity was judged to be from two and a half to three million feet at the time the drillers left on the night it was completed. The next morning when the well was visited there was no gas pressure and only a hole full of water remaining.

On October 7, 1910, another test was put down on the Brown farm, going to a depth of 1,236 feet. At 1,228 feet a second sand was struck, which is comparable to the Illinois Tracy sand. There was a quantity of gas giving off a strong sulphurous odor. The initial production was 150 barrels of oil, and for some time before it was put to pumping, it flowed 50 barrels daily. The drilling record of this well is as follows:

| Casing— | Feet. |
|---|---|
| 10 -in. | 124 |
| 8¼-in. | 420 |
| 6¼-in. | 607 |
| Oakland City sand (gas and oil) | 1,171–1,185 |
| Broken formation | 1,185–1,218 |
| Limestone | 1,210–1,218 |
| Shale | 1,218–1,228 |
| Second sand | 1,228–1,236 |

Immediately to the south of the Brown lease, in the southwest of the northwest of Section 13, there is a six-acre plot, the lease of which brought $600.00 bonus a few days after the drilling of the Brown well. On November 12 a very light producing oil well was drilled on this lease about 400 feet distant from the Brown well.

*Section 12, Patoka Township (T. 2 S., R. 8 W.).*

Following the drilling of the Brown well a dry hole was put down on the Johnson farm, southeast quarter of the southeast quarter of Section 12, going to a depth of 1,235 feet.

*Section 18, Patoka Township (T. 2 S., R. 7 W.).*

The three bores put down in this section are dry holes, both mentioned in the early history of the field. These wells are on the T. H. Wood farm, west half of the northwest quarter of the section.

*Section 7, Patoka Township (T. 2 S., R. 7 W.).*

There is but one well in this section, that being the first drilled of the Pioneer wells before mentioned.

*Section 9, Patoka Township (T. 2 S., R. 8 W.).*

The only endeavor in this section was near the Klondike Mine on the Eliza Martin farm, southwest quarter of the section. The result was a dry hole.

*Section 10, Patoka Township (T. 2 S., R. 8 E.).*

On the Eliza Martin farm of 180 acres, in the northwest quarter of the section, a dry hole was drilled, with the following detailed strata record:

*Record of Dry Hole on the Eliza Martin Farm.*

(Date completed, October 29, 1909.)

| Strata. | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Soil | 25 | 25 |
| Limestone | 3 | 28 |
| Sandstone | 7 | 35 |
| Limestone | 65 | 100 |
| Black shale | 32 | 132 |
| Sandstone | 43 | 175 |
| Limestone | 25 | 190 |
| Muddy slate | 15 | 205 |
| Limestone | 5 | 210 |
| Muddy slate | 20 | 230 |
| Sandstone (water) | 15 | 245 |
| Black slate | 10 | 255 |
| White slate | 95 | 350 |
| Salt sand (water) | 15 | 365 |
| Shale | 5 | 370 |
| Limestone | 10 | 380 |
| Muddy slate | 15 | 395 |
| Slate | 15 | 410 |
| White sand | 50 | 460 |
| Limestone | 15 | 475 |
| White slate | 25 | 500 |
| Sandy limestone | 50 | 550 |
| Slate and sand | 50 | 600 |
| Salt sand | 120 | 720 |
| Muddy slate | 60 | 780 |
| Limestone | 15 | 795 |
| Sand and shale | 105 | 900 |
| Black shale | 40 | 940 |
| Limestone | 15 | 955 |
| Lime shells | 45 | 1,000 |
| Muddy slate | 40 | 1,040 |
| Salt sand | 40 | 1,080 |
| Shale | 10 | 1,090 |

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Limestone | 10 | 1,100 |
| Shale | 5 | 1,105 |
| Salt sand | 25 | 1,130 |
| Limestone | 30 | 1,160 |
| White slate | 20 | 1,180 |
| Limestone | 15 | 1,195 |
| Slate | 5 | 1,200 |
| Shale | 30 | 1,230 |
| Sand | 15 | 1,245 |
| Shale | 10 | 1,255 |
| Sand | 5 | 1,260 |
| Salt sand | 15 | 1,275 |
| Sand | 15 | 1,290 |
| Shale | 10 | 1,300 |
| Brown sand | 15 | 1,315 |
| Brown shale | 10 | 1,325 |
| Sand blue lick water | 28 | 1,353 |

On the Cochran farm, southeast quarter of the southeast quarter of Section 10, there are three wells doing 50 barrels daily, the record being as follows:

| | No. 1, Feet. | No. 2, Feet. | No. 3, Feet. |
|---|---|---|---|
| Conductor | 12 | 12 | 12 |
| Casing— | | | |
| 10 -in. | .. | 128 | 123 |
| 8¼-in. | 500 | 485 | 495 |
| 6⅝-in. | 1,148 | 1,120 | 1,138 |
| Top of sand | 1,207 | 1,176 | 1,200 |
| Total depth | 1,259 | 1,218 | 1,238 |
| Initial production, 90 lbs. | | | |

On the J. G. Grimes lease, northeast of the southeast of the section, two dry holes were drilled, with the following record:

| | No. 1. Feet. | No. 2, Feet. |
|---|---|---|
| Conductor | 12 | 13 |
| Casing— | | |
| 10 -in. | 160 | 150 |
| 8 -in. | 500 | 490 |
| 6¼-in. | 1,143 | 1,150 |
| Top sand | 1,205 | 1,226 |
| Total depth | 1,239 | 1,244 |

These wells were drilled into salt water and they filled to the top.

*Section 11, Patoka Township (T. 2 S., R. 8 W.).*

The Swastika Oil Company, composed wholly of Oakland City business men, is operating a lease on the A. Hurt farm on the southwest quarter of Section 11 and the southeast quarter of Section 10. This company has 11 wells, with the following records:

| Date— | No. 1. Jan. 3, 1910. Feet. | No. 2. Apr. 15, 1910. Feet. | No. 3. June 10, 1910. Feet. | No. 4. July 24, 1910. Feet. | No. 5. Aug. 5, 1910. Feet. | No. 6. Aug. 4, 1910. Feet. |
|---|---|---|---|---|---|---|
| Casing— | | | | | | |
| 10-inch | 130 | 32 | 20 | 120 | 160 | 160 |
| 8¼-inch | 480 | 460 | 440 | 450 | ..... | ..... |
| 6¼-inch | 1,128 | 1,138 | 1,132 | 1,140 | 1,135 | 1,124 |
| Shot | 140 qts. | 160 qts. | 180 qts. | 180 qts. | 220 qts. | 225 qts. |
| Sand at | 1,185 | 1,199 | 1,196 | 1,199 | 1,194 | 1,182 |
| Thickness of sand | 47 | 49 | 43 | 52 | 52 | 40 |
| Break | 6 | 4 | 4 | 4 | ..... | ..... |
| Total | 1,232 | 1,248 | 1,245 | 1,251 | 1,246 | 1,222 |

| Date— | No. 7. Aug. 26, 1910. Feet. | No. 8. Oct. 6, 1910. Feet. | No. 9. Sept. 13, 1910. Feet. | No. 10. Oct. 12, 1910. Feet. | No. 11. Oct. 12, 1910. Feet. |
|---|---|---|---|---|---|
| Casing— | | | | | |
| 10-inch | 165 | ..... | ..... | ..... | 160 |
| 8¼-inch | ..... | 450 | 460 | 460 | ..... |
| 6¼-inch | 1,133 | 1,135 | 1,123 | 1,117 | 1,124 |
| Shot | ..... | 220 qts. | 120 qts. | 120 qts. | 100 qts. |
| Sand at | 1,199 | 1,203 | 1,185 | 1,188 | 1,179 |
| Thickness of sand | 49 | 54 | 46 | 42 | 37 |
| Pay at | ..... | ..... | 1,214 | ..... | 1,199 |
| Total | 1,244 | 1,257 | 1,231 | 1,230 | 1,219 |

No. 9 was drilled into salt water.

This lease was one of the most rapidly developed in the field, and is well equipped with a large Mascot belted power and a Bessemer gas engine pumping seven of the wells. This power can accommodate 25 wells and will, in time, be used to pump 15 or more. After No. 9 was completed the lease was reported to be making 180 barrels daily.

In the southwest corner of the southwest quarter of the section there is a small lease with two producing wells.

On the Whitman lease, in the northwest of the southwest of the section there are two wells making 18 barrels.

On the Thurman lease, northwest of the southwest of the section, there are two producing wells, the record of No. 2 being as follows:

(Completed, September 10, 1910.)

| Casing— | Feet. |
|---|---|
| 10 -in. | 200 |
| 8¼-in. | 480 |
| 6⅝-in. | 1,128 |
| Sand | 1,193 |
| Oil | 1,209 |
| Total depth | 1,227 |
| Initial production | 124 bbls. |
| Shot | 100 qts. |

On the Craig lease to the east of the Thurman and Whitman leases there are four producing wells, with the following record for Nos. 3 and 4:

| Casing— | No. 3. Feet. | No. 4. Feet. |
|---|---|---|
| 10 -in. | 26 | 123 |
| 8¼-in. | 444 | 435 |
| 6¼-in. | 1,132 | 1,109 |
| Sand | 1,177–1,231 | 1,120–1,223 |
| Total | 1,231 | 1,223 |

This lease, in November, was producing 40 barrels daily.

The Ohio Oil Company drilled four wells on the George Murray lease, southwest quarter of Section 11, Patoka Township, with the following records:

| | No. 1. Feet. | No. 2. Feet. | No. 3. Feet. | No. 4. Feet. |
|---|---|---|---|---|
| Casing— | | | | |
| 10-inch | 21 | 60 | 21 | 60 |
| 8¼-inch | 461 | 430 | 439 | 500 |
| 6¼-inch | 1,141 | 1,110 | 1,143 | 1,130 |
| Top of sand | 1,195 | 1,163 | 1,200 | ..... |
| Gas | 1,195 | 1,165 | 1,203 | 1,195 |
| Oil | 1,200 | 1,168 | 1,207 | 1,197 |
| Best oil | 1,205 | 1,172 | 1,215 | 1,200 |
| Total | 1,235 | 1,189 | 1,235 | 1,227 |
| Shot | 100 qts. | ..... | 80 qts. | 60 qts. |
| Production first 24 hours | 30 bbls. | 20 bbls. | 5 bbls. | ..... |
| Production second 24 hours | ..... | 15 bbls. | ..... | ..... |

On the E. J. Wiggs farm five wells have been drilled on the southwest quarter of the section and one on the southeast quarter. The latter, which was No. 1 on the lease, was practically a dry hole and was abandoned. No. 5 was also a dry hole. The other four wells are making 40 barrels daily. The record for No. 1 is as follows:

| | Feet. |
|---|---|
| Conductor | 11 |
| Casing— | |
| 10 -in. | 425 |
| 8¼-in. | 1,056 |
| Sand | 1,178–1,183 |
| Sand and lime | 1,225–1,235 |

On the E. J. Wiggs farm, southwest of the southeast of the section, there was one producing well.

On the Fred Wiggs five-acre lease, southwest of southeast, a good producing well with the following record:

| | Feet. |
|---|---|
| Conductor | 12 |
| Casing— | |
| 10 -in. | 134 |
| 8 -in. | 485 |
| 6¼-in. | 1,121 |
| Sand | 1,160–1,177 |
| Initial production | 75 bbls. |

On the Burchfield lease, southeast of the southeast of Section 11, a dry hole was drilled. Here but one sand was passed through and Blue Lick water was reached at 1,235 feet.

On the B. Keaton lease, southeast quarter of the northwest quarter of the section, three producers have been drilled, with the following record for two of them:

| | No. 1, Feet. | No. 2, Feet. |
|---|---|---|
| Casing— | | |
| 10 -in. | 190 | 105 |
| 8¼-in. | 435 | 530 |
| 6¼-in. | 1,140 | 1,139 |
| Sand | 1,194–1,214 | 1,183–1,216 |
| Total depth | 1,235 | 1,216 |

On the Eliza Martin farm, in the southwest quarter of the northwest quarter of the section, five wells have been drilled, the records being as follows:

| Date Completed— | No. 1. Feet. | No. 2. Sept. 12, 1910. Feet. | No. 3. Nov. 4, 1910. Feet. | No. 5. Nov. 10, 1910. Feet. |
|---|---|---|---|---|
| Lime | ..... | 1,106–1,140 | 1,086–1,110 | 1,083–1,123 |
| Oil sand | 1,163–1,185 | 1,161–1,179 | 1,167–1,194 | 1,139–1,192 |
| Best oil | 1,173–1,185 | 1,167–1,179 | 1,186–1,194 | 1,176–1,192 |
| Break | ..... | 1,179–1,194 | ..... | ..... |
| Brown lime | ..... | ..... | 1,203–1,205 | ..... |
| Total | 1,217 | 1,214 | 1,205 | 1,192 |
| Casing— | | | | |
| 10-inch | 145 | 160 | 160 | 125 |
| 10½-inch | ..... | ..... | ..... | 20 |
| 8-inch | 420 | 418 | 435 | 440 |
| 6¼-inch | 1,107 | 1,109 | 1,086 | 1,083 |
| Shot | 220 | ..... | 80 qts. | 60 qts. |
| Conductor | 69 | 8 | ..... | ..... |

On the Thurman lease, northwest quarter of the northeast quarter of the section, a dry hole was put down, with the following record:

| Casing— | Feet. |
|---|---|
| 10 -in. | 85 |
| 8 -in. | 535 |
| 6¼-in. | 1,130 |
| Sand | 1,145–1,154 |
| Total depth | 1,228 |

On the northeast quarter of the northeast quarter of Section 11, one bore was put down, getting only a showing of oil. The result was practically a dry hole, with the following record:

| Casing— | Feet. |
|---|---|
| 10 -in. | 85 |
| 8¼-in. | 535 |
| 6¼-in. | 1,109 |
| Sand at | 1,161 |
| Total depth | *1,218 |

*Not all sand.

*Section 2, Patoka Township (T. 2 S., R. 8 W.).*

In this section but one bore was sunk. This was put on the E. Martin lease, southeast quarter of the southwest quarter of the section. The result was a dry hole.

GAS IN THE OAKLAND CITY FIELD.

Locations of the various gas wells are noted in the foregoing records, but the following will give an idea of the supply of gas in the field. As is generally known, one of the principal causes of the wholesale abandonment of the wells in the Trenton rock field of the State was a lack of fuel to furnish power to pump the small producing wells. The production in these wells having fallen off to such an extent and the gas supply having failed, it did not pay to buy fuel to pump them. Had the gas been husbanded, many of them could yet be pumped with profit. However, in the Oakland City field, the operators have realized the mistakes made in the old field and are willing to do what they can toward conserving the gas supply for the future. When the wells have paid out and have dwindled so that the output is but two or three barrels per well per day they will still be able to pump them with the fuel at hand, and the returns will be clear profit.

However, the State Supervisor seems to have had his troubles. Early in 1910 he made a visit to the field and found that wells which had been recently drilled in and not yet put to pumping were left open and the gas allowed to escape. He at once ordered them closed in and ordered that all gas producing wells should be closed in as soon as completed. The oil operators obeyed, but, finding that they were losing money because of the cutting or roiling of the oil, making it frothy so that the pipe lines refused to take it off their hands, they again opened up their wells and prepared to stand trial and bring the gas laws to a test. Several of the operators were arrested and their cases were brought before a justice of the peace. Here the cases were thrown out because, in a mysterious way, the last legislature had repealed the penalty clause of the law pertaining to gas waste. Later an injunction suit to prevent waste of gas was filed in the Circuit Court at Petersburg. Here, again, the State was defeated and the injunction refused. In the history of the Oakland City field, however, there has been but little wanton waste of gas, and from conversation with various operators, it is my opinion that they desire to conserve the gas. They realize its value and are looking toward the future. However, some people interested in gas production claim that the pressure has been weakened by wells being left open before being put to pumping.

In almost every lease enough casing head gas is produced to furnish fuel for pumping the wells on the lease. Many have enough

gas for both drilling and pumping power. Those who do not, buy gas from other producers who have large producing gas wells.

The well on the Nixon lease furnishes gas for fuel in Oakland City. The company which operates this well is getting 20 cents per thousand cubic feet for the gas, and has so far sold twenty-eight million cubic feet from the one well. This well, it might be noted, was drilled only eight feet in the sand and has never been shot.

The M. Burnett well is furnishing gas for field purposes to the Murphy Oil Company and, in addition, feeds boilers for powers and drilling wells. The well on the Sim Burnett farm is standing idle, and the owners are said to be trying to sell their gas to the Oakland City company, or to a firm which has received a franchise for selling gas in the town of Winslow. This firm is now installing its plant and laying lines to the field.

The Ohio Oil Company is using gas from the well of the Johnson (Grim) farm for field purposes.

The gas well on the Bertha Williams farm is closed in.

The well on the J. Kays farm is furnishing gas to the Shoup Oil Company leases. Other gas wells are either shut in or furnishing to the drilling wells or pumping powers.

A test at one of the wells in the field was made of a recently patented device for making gasoline out of the casing-head gas. The result was unsuccessful, as only one pint of gasoline was taken from 1,000 cubic feet of gas under the most favorable circumstances. This device is being used successfully in other fields.

*The Life of Wells.*—The drop-off in production of oil in wells in the Oakland City field is very pronounced. Wells in the mile-wide territory that comprises the main producing territory of the field have an initial output of from 100 to 200 barrels and even as high as 285 barrels daily. These wells, as a general thing, drop off in production in about 30 days to 40 or 50 barrels daily, and from that gradually dwindle to 10 barrels in about a year's time and hold pretty well at that point.

*The Cost of Producing Wells.* In talking to two of the leading operators in the field, they were asked what was the approximate cost of a producing well put to pumping. One who had put down nine wells replied that they had cost him between $3,200 and $3,500 apiece, and that this cost was too great for him to make any money.

The other operator questioned, who had drilled 30 wells in and around the field, replied that his wells had cost him $3,700 each.

The following are the standard prices for supplies necessary to put a well to pumping, quoted at one of the supply stores at Oakland City:

| | |
|---|---|
| Casing— | |
| 10 -in. (second hand), per foot | $0 95 |
| 8¼-in. (second hand), per foot | 62 |
| 6¼-in. (new iron) per 100 feet | 42 75 |
| 6¼-in. (new steel), per 100 feet | 40 70 |
| 5 -in. (iron), per 100 feet | 33 00 |
| Tubing, 2-in., per 100 feet | 12 00 |
| Rods, per 100 feet | 4 03 |
| Line pipe, 2-in. (iron), per 100 feet | 11 75 |
| Line pipe, 2-in. (steel), per 100 feet | 8 85 |
| Wooden conductor, per feet | 50 |
| Pull rods, per 100 feet | 5 00 |
| Pumping outfit | 14 00 |
| Casing head | 2 38 |
| Pumping jack | 15 50 |
| Two tanks and tank house | 250 00 |
| 25 H. P. engine, Twentieth Century power, cement foundation and floor, wooden power house (Accommodating 25 wells, ready to start.) | 1,675 00 |
| 15 H. P. engine, small power accommodating 8 wells, cement foundations and floor, ready to start | 925 00 |

The three supply companies having stores at Oakland City are the "Oil Well Supply Co.," the "Illinois National Supply Co," and the "Jarecki Supply Co." There is also a machine shop for the repairing of drillers' implements.

### COST OF DRILLING AND PRICE OF LABOR.

The standard price paid for drilling in the Oakland City field is one dollar per foot. A greater price, of course, was paid when wildcatting was first being done in the field. The average time taken to complete a well is twenty days, barring all accidents.

After the drilling in and shooting of a well, the contractor gets $20 a day for cleaning out until the well is put to pumping.

Labor has been plentiful in Oakland City, as many drillers and other help have come there from other fields. The prices paid for labor are as follows:

| | |
|---|---|
| Drillers, per day | $5 00 |
| Tool dressers, per day | 4 00 |
| Pumpers, per month | 71 00 |
| Teamsters, including team, on lease, per day | 4 00 |
| Teamsters, for contractors, per day | 5 00 |

## THE SHOOTING OF WELLS.

Much trouble has been experienced in the shooting of wells in the Oakland City field. At first large shots (100 to 200 quarts of nitroglycerine) were deemed necessary to make the proper crevice in which the oil was to flow. In shooting with the large shots the casing had to be pulled out beforehand, as the bottom of the 6¼-inch casing was too close to the shooting point and, there not being enough water to hold the shot down, the casing would collapse if left in. The pulling of the casing takes about six hours, and the replacing another six hours. Later, however, the larger operators tried the experiment of shooting with a small shot with the casing left in, and then shooting again if the cavity made was not large enough. Sixty quarts is the largest shot that should be used if the casing is left in. When the shooting is done with the casing in the bore, the shot is set off by the dropping of a "jack squib," but when the casing is pulled the shot is fired by means of an electrical battery.

The companies having shooters in the Oakland City field are the DuPont Powder Co. and the Illinois Torpedo Co. They have magazines in out-of-the-way places in the country around Oakland City. The standard price for shooting is one dollar a quart.

The oil men of Oakland City are very well pleased with the new well-plugging law, and when a dry hole has been drilled in, plug it as soon as possible. They claim that one improperly plugged hole will ruin all the producing wells in the vicinity, especially where the hole is filled with salt water. A list of the plugged wells or dry holes in the Oakland City field from October, 1909, to December 1, 1910, is as follows:

| Number of Well. | Farm. | Township. | Section. |
|---|---|---|---|
| 2 | Jno. Cooper | Monroe | 23 |
| 1 | Lemon | Monroe | 6 |
| 1 | E. Martin | Patoka | 10 |
| 1 | P. Mason | Monroe | 27 |
| 1 | M. Thompson | Monroe | 13 |
| 1 | Jos. McKinney | Monroe | 35 |
| 1 | Edgar Grubb | Monroe | 2 |
| 1 | Ashby | Monroe | 35 |
| 1 | E. Connor | Monroe | 35 |
| 5 | J. B. Cato | Monroe | 28 |
| 1 | C. D. Houchens | Monroe | 22 |
| 1 | N. Williams | Monroe | 24 |
| 1-2-3 | W. Perigo | Patoka | 15 |
| 4 | W. D. Mason | Monroe | 26 |
| 5 | J. B. Cato | Monroe | 27 |
| 3 | Jno. Clifford | Monroe | 23 |
| 1 | W. W. Shy | Monroe | 22 |
| 3 | Bertha Williams | Monroe | 22 |
| 3-4 | Oliver Mason | Monroe | 22 |
| 4 | A. Skinner | Monroe | 22 |
| 5 | Henry Wiggs | Patoka | 11 |
| 1 | John Kays | Monroe | 27 |
| 1 | H. Yager | Monroe | 26 |
| 1-2 | J. D. Grimes | Patoka | 10 |
| 1 | G. Cato | Monroe | 19 |
| 5 | G. B. Grimm | Monroe | 23 |
| 1 | T. J. English | Monroe | 27 |

Those wells plugged outside the Oakland City field, but in the southwestern portion of the State, are as follows:

| Owner of Farm. | County. | Township. | Section. | Drilled by |
|---|---|---|---|---|
| Maurice Spaulding | Daviess | Bar | 36 | J. B. Graham. |
| Wm. Rausch | Dubois | Patoka | 33 | Wm. Rausch. |
| Geo. W. Kendall | Dubois | | 35 | F. W. Whitmire. |
| Commodore Dixon | Dubois | Jefferson | 24 | Alex. McDonald. |
| Geo. Kirner | Dubois | Patoka | 35 | Clark Crowe. |
| A. J. Bottles | Harrison | Scott | 23 | C. W. Veitch. |
| W. M. Jones | Knox | Harrison | 9 | R. G. Griffin. |
| P. Arvin | Martin | Perry | 35 | J. B. Graham. |
| Eliza Martin | Pike | Washington | 7 | W. McLaughlin. |
| Sarah Hornady | Pike | Washington | 28 | W. F. Lory. |
| P. Willis | Pike | Madison | 5 | Ohio Oil Co. |
| W. H. Smith | Pike | Logan | 20 | J. A. Crawford. |
| Fred Frakes (1 and 2) | Spencer | Jackson | 2 | Southern Oil & Gas Co. |
| W. Williams | Spencer | Jackson | 2 | Southern Oil & Gas Co. |
| Gray Bullock | Spencer | | 2 | J. M. Hatfield. |
| S. E. Kercheval | Spencer | Clay | 18 | Smith Neely Oil Co. |
| John Hill | Spencer | | 6 | J. M. Hatfield. |
| Lee McGlothlin | Warrick | Lane | 28 | M. Murphy Oil Co. |
| J. B. Thompson | Warrick | Owen | 21 | W. J. Rodgers. |
| Jno. A. Miller | Warrick | Hart | 36 | Ohio Oil Co. |

The above comprise most of the wildcat wells drilled in the southwestern portion of the State. Some of the drilling records of these wells will be found below.

A record of the well on the A. J. Bottles farm, Section 23, Scott Township, Harrison County, was furnished by Mr. Arthur Pratt, contractor. It is as follows:

| | Thickness, Feet. | Depth, Feet. |
|---|---|---|
| Clay | 35 | .. |
| Gravel | 12 | 47 |
| Hard white lime | 35 | 82 |
| Cavy mud and boulders | 14 | 96 |
| White limestone | 190 | 286 |
| Brown limestone | 60 | 246 |
| White limestone | 15 | 361 |
| Brown limestone | 40 | 401 |
| Limestone shells | 20 | 421 |
| Hard white sand | 50 | 471 |
| Soft limestone | 10 | 481 |
| Hard white sand | 50 | 531 |
| Dark limestone | 10 | 541 |
| Shale | 50 | 591 |
| Black shale | 110 | 701 |
| White sand | 15 | 716 |
| Gray sand | 10 | 726 |
| White sand | 20 | 746 |
| Dark lime | 260 | 1,006 |
| Shale | 49 | 1,055 |
| Lime | 35 | 1,090 |
| Shale | 50 | 1,140 |
| Sandy lime | 35 | 1,175 |
| Salt water sand | 25 | 1,200 |
| Salt water sand | 40 | *1,240 |

*Total depth.

Water was found as follows:

| | Feet. |
|---|---|
| Sulphur water at | 390 |
| Great amount of water at | 410 |
| Small amount of water at | 850 |
| Salt water at | 1,220 |

The record of the bore on the Wm. Rausch farm, Section 33, Patoka Township, Dubois County, is as follows:

At 415 feet, 10 feet of sand.
At 815 feet, 15 feet of sand, a little gas.
At 1,006 feet, 12 feet of sand, showing of oil.
1,006–1,091 feet, slate.
1,091–1,150 feet, limestone.
Total feet 1,150.

| Casing— | Feet. |
|---|---|
| 10 -in. | 80 |
| 8¼-in. | 520 |
| 6¼-in. | 976 |

A record of the well drilled by the Ohio Oil Company on the John A. Miller farm, Section 36, Hart Township, Warrick County, is as follows:

| Casing— | Feet. |
|---|---|
| 10 -in. | 60 |
| 8¼-in. | 815 |
| 6¼-in. | 1,093 |
| Top of sand | 1,131 |
| Total depth | 1,427 |

The record of the well drilled on the P. Willis farm, northwest quarter of Section 5, Madison Township, Pike County, is as follows:

| Casing— | Feet. |
|---|---|
| 10 -in. | 89 |
| 8¼-in. | 700 |
| 6¼-in. | 1,100 |
| Salty sand | 1,319 |
| Total | 1,324 |

The record of the well on the Sarah Hornaday farm, Section 28, Washington Township, Pike County, is as follows:

| Casing— | Feet. |
|---|---|
| 10-in. | 120 |
| 8¼-in. | 454 |
| 6¼-in. | 973 |
| Sand | *1,005–1,035 |
| Total | 1,200 |

*Showing of oil.

PRODUCTION IN THE OAKLAND CITY FIELD.

Two companies, the Pure Oil Company of Pittsburg and the Ohio Oil Company, are buying the crude oil from the Oakland City field. In June, 1909, the Pure Oil Company commenced taking the production. Their oil is pumped into five 27,500-barrel tanks at Muren Station and is loaded by means of a 12-car loading rack and shipped from this point.

In November, 1910, the Ohio Oil Company completed a six-inch branch pipe line from Bridgeport, Illinois, to the Oakland City field. This line connects with a line from Bridgeport to the Mar-

tinsville, Illinois, tank farm. This Oakland City pipe line enters the field through sections 21 and 22. Both the Ohio and the Pure Oil companies have three- or four-inch lines laid along all the main roads throughout the field. From these, two-inch laterals are run to tank houses on the leases. Small "donkey pumps,, are used to force the oil through the lines.

The total well runs for the Oakland City field from June 5, 1909, until December 1, 1910, by both companies, was 591,780.3 barrels.

The price of the Oakland City oil has remained at 60 cents for some months.

### CHEMICAL PROPERTIES OF OAKLAND CITY OIL.

The crude oil from the Oakland City field is a dark, thick liquid with a disagreeable odor and a mixture of paraffine and asphalt base. A sample of the oil from a well in the middle of the field was sent to T. W. Smith, analytical chemist. The results of his tests are, for comparison, placed by the side of those of a sample of Trenton rock oil from Van Buren, Indiana, and are as follows:

| | Oakland City. | | | | Van Buren. | | | |
|---|---|---|---|---|---|---|---|---|
| | Per Cent. | Specific Gravity. | Degrees Beaume. | Flashing Point. | Per Cent. | Specific Gravity. | Degrees Beaume. | Flashing Point. |
| Original Oil..... | ..... | 0.847 | 36° | ..... | ..... | 0.853 | 35° | ..... |
| Below 150°C..... | 10.5 | 0.734 | 62° | Below 20°C. | 7.2 | 0.719 | ..... | Below 20°C. |
| 150°-200°C..... | 12 | 0.756 | 57° | Below 20°C. | 10.2 | 0.759 | 56° | Below 20°C. |
| 200°-250°C..... | 11 | 0.790 | 47° | Below 38°C. | 10.2 | 0.799 | 47° | 60°C. |
| 250°-300°C..... | 9.5 | 0.810 | 44° | Below 81°C. | 12.2 | 0.826 | 41° | 82°C. |
| 300°-350°C..... | 10.5 | 0.846 | 36° | Below 122°C. | 14.8 | 0.844 | 37° | 96°C. |
| 350°-400°C..... | 10 | 0.860 | 34° | Below 123°C. | 41.8 | 0.860 | 34° | 38°C. |
| Total distillate to 400°C..... | 63.5 | ..... | ..... | ..... | 96.4 | ..... | ..... | ..... |

From the table it will be seen that the Oakland City oil yielded 10.5 per cent. naphtha below 150 degrees C. and 25 per cent. kerosene up to 275 degrees C., while the Trenton rock oil yielded 10 per cent. naphtha and 33 per cent. kerosene below and up to the same temperatures. The total residue above 400 degrees C. amounted to 34.5 of the original oil. It had a specific gravity of .955, or 17 degrees Beaume, and is very suitable for a road oil for the surface of roads.

OIL AND COAL RIGHTS.

Since the Oakland City oil field is within the limits of the coal producing area of the State, the question of the rights of oil operators to drill through coal lands which are under lease or being mined by coal companies has several times arisen. It was specifically brought up in October, 1910, by David Ingle, president of the Ayrshire Coal Company, who, in a letter to the Director of the Indiana Department of Geology, asked the following questions:

I. Will you please advise us what the law is, or if no law, what the procedure is, in Indiana, with reference to drilling oil and gas wells through the coal seams and mines in Indiana.

II. Is there any law, or any reason why, if oil wells are properly cased and plugged, we should not remove the coal right up to and against the 10-inch casing of such a well?

III. Could you also advise us whether, when we have bought and had a deed properly recorded for the coal under a man's land, we could legally resist the attempt of an oil driller to drill through our coal, when he is drilling under an oil or gas lease given subsequent to our filing and recording of our purchase of the coal under the same property?

Since these questions involved legal points upon which the Director did not wish to pass, they were submitted to Hon. James Bingham, Attorney-General of Indiana, who, on October 14, rendered his decision as follows:

STATE OF INDIANA,
INDIANAPOLIS, IND., October 14, 1910.

Hon. W. S. Blatchley, State Geologist,
Indianapolis, Indiana:

DEAR SIR—I am in receipt of your letter of October 7th, enclosing letter from Mr. David Ingle, president of the Ayrshire Coal Company, in which you request my opinion as to whether the owner of all the coal under the surface of certain real estate can legally resist the attempt of an oil driller to drill through such coal in order to get the oil beneath it, in case where the oil driller is the owner of an oil or gas lease given subsequent to the conveyance of such coal by the owner of the surface. Also as to whether the owner of such coal is legally entitled to remove the coal up to and against the casing of such oil or gas well.

The owner of the fee in real estate owns all below the surface, and there may be separate and distinct estates in different persons in the surface of land, the coal under the land, and the right to take oil or gas through the coal owned by one person and the surface owned by another.

The owner of the fee may legally sell and convey the coal under his land to one person and give by contract the right to a third person to take the oil or gas from below the coal strata.

Coal under the surface in place is itself real estate, and title to it may be severed from title to the surface and pass to different persons.

Brand v. Consolidated Coal Co., 76 N. E. 849;
Kincaid et al. v. McGowan et al. (Ky.), 13 L. R. A. 289;
Peterson v. Hall, 50 S. E. 603;
Lillibridge v. Coal Company, 143 Pa. 293.

While the grantee of the coal under the surface owns such coal he owns nothing else, save the right to access to it and the right to remove it. His rights in the real estate terminate upon the removal of the coal. As said in the case of Chartiers Block Coal Co. v. Mellon, 152 Pa. St. 286, at page 297:

> "When the coal is all removed the estate ends for the plain reason that the subject of it has been carried away. The space it occupied reverts to the grantor by operation of law. It needs no reservation in the deed because it was never granted."

It was further said in this case, that,

> "The owner of the coal must so enjoy his own rights as not to interfere with the lawful exercise of the rights of others who may own the estate, either above or below him. The right of the surface owner to reach his estate below the coal exists at all times."

This being true, and the owner of the surface having the right to reach his estate below the coal strata, he has also the legal right to grant such a right to others, and, in my opinion, the oil operator or gas driller has a right to place his machinery upon the surface, pursuant to the terms of his grant or lease, and drill through the coal strata to the oil or gas below, under conditions and regulations of such a character as not to materially injure the coal owner in his rights to remove the coal.

It is also my opinion that where such gas or oil wells are properly cased, the owner of the coal, through which they are drilled, may legally remove the coal adjacent to such pipes in such a manner as not to materially injure or destroy such pipes or wells.

The rights of the coal owner and the gas or oil driller may both be upheld when each, in securing his property, pursues a course that will not unnecessarily injure the other, and it can not matter in the least which of them first received such rights by grant from the surface owner. I return herewith the letter of Mr. Ingle.

I have the honor to be,

Very truly yours,

JAMES BINGHAM,

Attorney-General.